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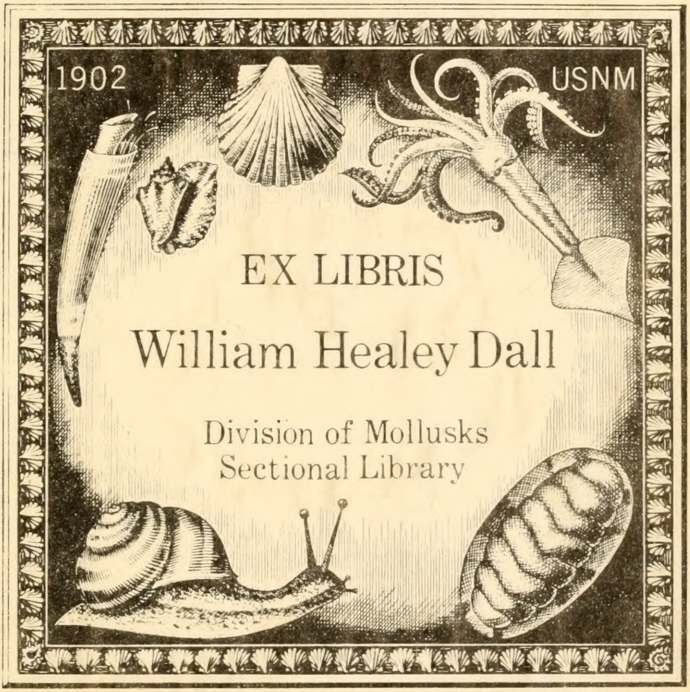

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# A
# HISTORY
# OF
# BRITISH MOLLUSCA,
# AND THEIR SHELLS.

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# HISTORY

OF

# BRITISH MOLLUSCA,

## AND THEIR SHELLS.

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BY

PROFESSOR EDWARD FORBES, F.R.S.,

OF KING'S COLLEGE, LONDON;

AND

SYLVANUS HANLEY, B.A., F.L.S.,

OF WADHAM COLLEGE, OXFORD.

## VOLUME II.

INCLUDING THE REMAINING FAMILIES OF BIVALVES, THE PTEROPODA, AND THE GASTEROPODA AS FAR AS IANTHINIDÆ.

LONDON:
JOHN VAN VOORST, PATERNOSTER ROW.

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# BRITISH MOLLUSCA.

## CARDIADÆ.

The Cockles, properly so called, form a very natural assemblage, presenting well-marked characters both of shell and animal. Their shells are of variable thickness, sometimes strong, in other cases very tender, and are often sculptured in bold and striking relief. The furrows upon them are usually radiating, a feature which prominently distinguishes them from the majority of shells in the last family, and the ridges are often ornamented by arched scales. The dentition of the hinge is very variable, often strongly marked, sometimes nearly obsolete. The pallial sinus is entire, corresponding to the structure of the mantle and siphons, the latter being distinct, but very short, and nearly sessile. Their bases and sides are fringed. The mantle is freely open in front. The foot is remarkable for its geniculated form and great size, enabling the animal to make leaps prodigious in proportion to its dimensions.

*Isocardia* is often included by authors in this family; but, as we have already seen, it has much nearer affinities with *Cyprina* and its allies. The only British genus truly a member of the group is *Cardium;* one which, from the number, abundance, and beauty of its species, plays no unimportant part in our marine fauna. The family connects the tribe last treated of with the *Kelliadæ* and *Cycladidæ*, and is probably parallel with the *Lucinidæ*, which we are compelled to treat of in sequence.

### CARDIUM, Linnæus.

Shell equivalve, more or less cordiform, oblong, or transversely ovate, usually inflated, closed or gaping posteriorly, longitudinally ribbed or furrowed in radiating fashion from the prominent beaks, rarely smooth; ribs often scaly or spiny; margin almost always crenulated. Hinge composed of two oblique primary teeth in each valve, and two remote lateral ones (in certain exotic forms the teeth become partially or wholly obsolete). Ligament short, external, conspicuous; pallial impression simple.

Animal suborbicular, tumid, its mantle freely open in front, with plain, or, less frequently, fringed edges, conspicuously fimbriated in the neighbourhood of the two very short, slightly-separated siphons, the branchial one of which is always fringed at the orifice. Foot very large, cylindrical, geniculated. Branchial leaflets unequal, labial palps rather long and triangular.

This great and very natural genus preserves its Linnæan constitution, and every day receives accessions to its ranks from the researches of zoologists investigating distant regions. The shells composing it are often remarkable for their elegance of form and brilliancy of colouring, and even our few British species are among the handsomest of our bivalve mollusks. There is a pleasure in investigating a group such as this, wherein we find not only the greatest variety, but also the greatest distinctness, and consequent certainty of specific determination. All that is known as yet of the animals of the several species goes to indicate that the features they present are as distinct as those exhibited by their shells.

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An assemblage presenting so many attractions has, of course, engaged considerable attention, and our knowledge of the extent and geographic range of the genus is consequently very advanced. There are, probably, very nearly two hundred species of *Cardium* in existence, and the localities of considerably more than half are well known. We find the great central assemblage of Cockles in the Indian ocean, a region where about a third of the species are congregated. Around this centre the number of specific forms diminishes, though found in every sea. They are most plentiful everywhere within the tropics, and diminish as we proceed northwards and southwards; but some of the forms most prolific in individuals, and most gregarious in habit, are present in cold climates, and make up by abundance for the absence of variety. Of these, several are valuable articles of food; and it may be said of all the *Cardia* that they hold a high rank among mollusca both for nutritive qualities and excellence of flavour. The genus contains several remarkable abnormal forms; some of the most singular are to be found in the Caspian and other relics of the great Aralo-Caspian Sea,—the demonstration of which mighty inland ocean is among the finest discoveries of Sir Roderick Murchison.

The geological distribution of this interesting group corresponds in extent with the geographical. Even in Palæozoic strata we find the fossilized remains of mollusks closely allied, if not belonging to *Cardium*. In the secondary rocks, even in their oldest members, well-marked forms of *Cardium* are not unfrequent, often singularly simulating those of existing times. During the later part of the secondary epoch and the beginning of the tertiary a group of half-ribbed Cockles, seemed to have been developed at the expense of ordinary forms, and to have dwindled away as they came near our own epoch, when but two or three allies of them are found.

Cockles inhabit all depths of water, from the sea-shore at tide-mark to the deepest sea-beds as yet explored; but each species has a very definite range, and the succession of representative forms is as well marked bathymetrically as it is in horizontal space and in time. Sand, or sandy-mud is their usual habitat, and in it they lie buried, often in prodigious numbers.

Dr. Carpenter has examined the microscopic structure of the shell in this genus, and states that there is a tubular texture in the external layer, but little organic structure in the internal.

## C. ACULEATUM, Linnæus.

Large, swollen, not solid; ribs about twenty in number, rather depressed, armed with compressed prickles; their interstices almost smooth.

Plate XXXIII. Fig. 1.

*Cardium aculeatum*, LINN. Syst. Nat. ed. 12, p. 1122.—PENN. Brit. Zool. ed. 4, vol. iv. p. 90, pl. 50, f. 37.—DA COSTA, Brit. Conch. p. 175.—DONOV. Brit. Shells, vol. i. pl. 6 (not well).—MONT. Test. Brit. p. 77, and Suppl. p. 30.—Linn. Trans. vol. viii. p. 62.—TURT. Conch. Diction. p. 28.—TURT. Dithyra Brit. p. 180, pl. 13, f. 6, 7.—FLEM. Brit. Anim. p. 420.—Brit. Marine Conch. p. 95.—BROWN, Illus. Conch. G. B. p. 87, pl. 34, f. 1, 2, 3.—CHEMN. Conch. Cab. vol. vi. p. 161, (in part) pl. 15, f. 156.—POLI, Test. Sicil. pl. 17, f. 1, 2, 3.—WOOD, General Conch. p. 207, (not variety,) pl. 48.—DILLW. Recent Shells, vol. i. p. 114.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 397.—PHILIPPI, Moll. Sicil. vol. i. p. 50, and vol. ii. p. 37.—SOWERBY, Conchol. Illustrations, Cardium, f. 28.—HANL. Recent Shells, vol. i. p. 131.—REEVE, Conch. Iconica, Cardium, pl. 4, f. 17.

" *ciliare*, (YOUNG.) PENN. Brit. Zool. ed. 4, vol. iv. p. 90, pl. 50, f. 39.—PULTENEY, in Hutchins, Dorset, p. 31.—DONOV. Brit. Shells, vol. i. pl. 32, f. 2.—MONT. Test. Brit. p. 79.—Linn.

Trans. vol. viii. p. 64.—Dorset Catal. p. 31, pl. 4, f. 1.—
Wood, General Conch. p. 209, pl. 49, f. 3, 4.
*Cardium parvum*, Da Costa, British Conch. p. 177.
Encyclopédie Méthodique, Vers, pl. 298, f. 1.

As the shape and parts of the present species most closely resemble those of the succeeding, to avoid repetition, we shall merely specify the particulars in which it differs. It is a light, thin, bulky shell, and of far more ample dimensions than the majority of the individuals of *echinatum;* its tumidity, too, is not so evenly disposed, there being a manifest, though not considerable, flattening of surface behind the usual site of the umbonal ridge, causing a slight angularity of curvature, preceding which is the chief convexity, whilst the swell in the species we are comparing it with is almost central. Its contour is far more angulated than in the small ordinary suborbicular type of the latter, but very nearly resembles the large variety of it which we have delineated in our engraving. Its ventral margin, however, is less arcuated; its posterior lower angulation more decided, its hinder edge rectilinear or subretuse (thus biangulating the broad posterior extremity), and its anterior dorsal edge is rather more sloping, which gives a marked projection to the prominent umbones. The beaks seem less inclined forwards; and the ligament is very large and elevated. The surface has but little lustre, but is not utterly dull; the number of ribs ranges at least from eighteen to twenty-two, which are often almost obsolete at the posterior extremity, and not merely, as in *echinatum*, diminished in size and elevation. They are rather less raised, too; much flattened on their upper surfaces, and armed with rather large and crowded spines; of which the hinder rows (whose prickles are generally the longest and largest) are sharp-pointed, straight, and somewhat lancet-shaped, or laterally compressed, enlarging at their bases parallel to the ribs ; the central series are similarly shaped, but bend posteriorward ; and the front ones, which are shorter, and more solid, are compressed (in the mature shell) horizontally (or at right angles to the ribs), and are either blunt-topped, or bend upward at their apices. The interstitial sulci, which are scarcely as broad as the ribs, are only delicately marked with very fine and regular-raised concentric striulæ, which are not developed in the immature examples, and consequently are absent from the umbonal region of the adult ; they are not at all flexuous, a character which affords a ready means of distinguishing this species from the two succeeding ones. The lateral teeth, particularly the front one, which is generally the more approximate, are very large.

The external colouring is also of a less yellow cast than in the next species, being usually of a pale-brownish flesh-colour, with livid or rufous zones. The sides of the adult are always very unequal, the outline being then oblique, and the umbones much nearer to the anterior commencement of the shell. The British specimens appear generally more elongated than the Mediterranean ones, which are more orbicular, less flattened behind, and more fully weaponed.

The young shell is less inequilateral and oblique, and devoid of any inferior angle at the hinder extremity. The dorsal line is much more sloping than in *echinatum*, ascending slightly on the hinder side.

A good-sized example will measure four inches in length, and three and a third inches in breadth.

Poli states that the animal of this species is of a cinnabar colour ; the foot long, subulate ; the bases of the tubes not fimbriated ; the last statement, however, is probably a mistake.

It is a remarkably local shell, and we believed it peculiar to the South Devon coast; it is stated, however, to have been captured also in Dublin Bay and Portmarnock in Ireland, and in the Hebrides and Orkney Islands (Captain Brown), but has evaded all recent researches in those districts. It is rightly a member of the Lusitanian fauna, and extends its range throughout the Mediterranean; in many parts of which sea it is as common as it is rare on our coasts.

### C. ECHINATUM, Linnæus.

Large, suborbicular, more or less strong; ribs only eighteen or nineteen, much elevated, square-topped, spinous; interstices with coarse irregular and somewhat flexuous elevated wrinkles.

Plate XXXIII. fig. 2, and (Animal) Plate N. fig. 3.

LISTER, Hist. Conch. pl. 324. f. 161.

*Cardium echinatum*, LINN. Syst. Nat. ed. 12, p. 1122.—PENN. Brit. Zool. ed. 4, vol. iv. p. 90 (badly).—DA COSTA, Brit. Conch. p. 176, pl. 14, f. 2.—PULTENEY, in Hutchins, Dorset, p. 30.—DONOV. Brit. Shells, vol. iii. pl. 107, f. 1.—MONT. Test. Brit. p. 78 (not variety).—Linn. Trans. vol. viii. p. 63.—Dorset Catal. p. 31, pl. 6, f. 2.—TURT. Conch. Diction. p. 29.—TURT. Dithyra Brit. p. 183.—FLEM. Brit. Anim. p. 421.—MACGILL. Moll. Aberd. p. 271.—Brit. Marine Conch. p. 96.—BROWN, Illust. Conch. G. B. p. 87, pl. 34, f. 6.—CHEMN. Conch. Cab. vol. vi. p. 165, pl. 15, f. 158, (badly).—Magaz, Berlin. Gesel. Naturf. vol. ii. p. 113.—MULLER, Zool. Danica, pl. 13, 14.—WOOD, General Conch. p. 208, pl. 49, f. 1, 2.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 396.—Index Testaceol. pl. 5, f. 2.—PHILIPPI, Moll. Sicil. vol. i. p. 49, and vol. ii. p. 37.—HANL. Recent Shells, vol. i. p. 131, pl. 5, f. 2.—REEVE, Conchol. Iconica, Cardium, pl. 6, f. 34.

" *mucronatum*, POLI, Test. Sicil. vol. i. pl. 17, f. 7, 8.

" *spinosum*, SOWERBY, British Miscellany, pl. 32.—Linn. Trans. vol. viii. p. 63.

The general form is suborbicular, and very slightly heart-shaped, exhibiting a trifling degree of obliquity, and becoming of a more elongated outline with age. The valves are occasionally very solid, yet quite as frequently, but moderately strong, and not particularly heavy: they are opaque and tumid, destitute of lustre, and range from whitish (usually with squalid zones) to brownish rust colour. The surface is radiated with eighteen or nineteen strong and elevated ribs, which, emanating from the incurved beaks, squarely dentate the ventral margin at their termination. These ribs, which are well raised, and somewhat square-topped, bristle with crowded spines, which, planted nearly in the centre of them, are connected at their bases with each other, and assume a different look and shape according to the stages of growth and their various positions upon the shell. They are never much produced, and are generally indeed decidedly short: in the young, they are so compressed laterally as to form a coarsely serrated carina upon the ribs, which is consequently their appearance upon the umbonal region of the adult; they next become almost separated pyramidal sharp-pointed spines, of which the anterior rows are suddenly bent backwards, and their upper surfaces a little grooved out; finally the sharp ends gradually wear off, and their bases become solid, and no longer compressed. These prickles, which are generally of a paler hue than the ground colour, are coarser, more remote, and more spatulate in front; smaller, sharper, and more clustered behind. The interstices of the costæ are about equal to them in breadth, and are coarsely irregularly and somewhat flexuously roughened by concentrically disposed elevated wrinkles, whose peculiarities are most marked at the extremities of the shell, where the ribs greatly diminish in elevation, and their proportion to the intervening sulci is no longer observed.

The ventral margin, by obliquely ascending in front, attenuates the anterior side; it is well arcuated, and rises a little behind likewise, so as to round off the incipient basal angulation of that extremity. The dorsal edges are almost straight, or barely convex; the front declination is the more manifest, but both are very trifling. The posterior edge, which is not much curved, forms a distinct angle at the upper corner; a less decided angulation takes place at the opposite end of the dorsal margin, where it is modified by the arcuation of the anterior edge; the front extremity is narrowed, the hinder is moderately broad. The ligament is rather large and projecting, but not elongated: the umbonal ridge is obsolete, the space beyond it being scarcely, if at all, flattened. The umbones are prominent, and more ordinarily subcentral; in very large examples, however, they closely approach the anterior end; the beaks are inflected, and lean slightly forwards; there is no lunule in front of them, but usually a somewhat heart-shaped area, devoid of costæ, of which the lips are generally elevated and pouting. The interior is white or pale, and neither stained at the hinge margin nor posteriorly with any colouring matter; the position of the external sulci is occasionally indicated by the internal surface being rather of a browner tint. The lateral teeth are large, and, the front one especially, tolerably approximate.

The diameter of the average of examples does not exceed two inches; we have taken a specimen at Torquay, however, which is three inches long, and more than two inches and a half broad.

The animal has been more than once figured, and was well delineated in the Zoologia Danica. It is shaped like the shell, and of a yellowish white or pale yellow colour, palest when young. The mantle is very muscular, and simple at its edges, white in the young shell, pale brown in some older specimens. The siphons are short, and but slightly separated; the branchial rather the largest, and fringed at its orifice by about sixteen simple white cirrhi, with minute yellow points at their bases. The anal orifice has its inner margin uniformly plain, but there are below it about twelve cirrhi, also red-dotted at their bases. The sides of the tubes and the neighbouring part of the mantle are dotted with scattered white filaments. Mr. Clark observes, that the tubes in a half-grown shell, of which the transverse measure was an inch and a half, and the ventral an inch and a quarter, were three-fourths of an inch in length. The foot is cylindrical, finger-shaped, geniculated, pale rose at the head, of a deeper red towards the middle and extremity. It is at least twice as long as the shell. "There are a pair of branchiæ on each side of the body, of the shape of segments of a circle, the upper one being as long as the lower, but from its narrowness not half the depth. They are pale-brown, conspicuously striated on their outer surfaces; less so within. The palpi are of the same colour, and are very long, linear, slender, pointed, and marked with raised transverse striæ on both surfaces."—Clark MSS.

This generally-distributed species is one of our most common bivalves, and inhabits various depths of water, from seven to eighty fathoms, all round our coasts. Muddy ground, sandy mud, and muddy gravel, are its favourite habitats. It is a solitary species or not truly gregarious, and is both brought up by the dredge from near the coast, and taken by trawlers far out at sea. The shores are sometimes, after stormy weather, strewed with its valves. To enumerate its localities would be to name all suitable places around our shores, for it is equally plentiful in the northern and southern districts.

It ranges throughout the European seas, and is known as a fossil in pleistocene deposits.

### C. RUSTICUM, Linnæus.

Large, solid, with at least twenty much elevated tuberculated and wrinkled ribs : tubercles more or less squamular on the anterior ribs, and more or less prickly on the posterior ones : interstices broad, and very coarsely wrinkled.

Plate XXXI. fig. 3, 4.

LISTER, Hist. Conch. pl. 329, f. 166.

*Cardium rusticum*, LINN. (not Lam. nor British writers) Syst. Nat. ed. 10, p. 681, ed. 12, p. 1124.—POLI, Test. Sicil. pl. 16, f. 5.—WOOD, General Conch. p. 225, pl. 55, f. 2, 3.

,, *tuberculatum*, LINN. Syst. Nat. ed. 10, p. 679? ed. 12, p. 1122?; Mus. Ulricæ, p. 488.—PULTENEY in Hutchins, Dorset, p. 30. —DONOV. Brit. Shells, vol. iii. pl. 107, f. 2.—MONT. Test. Brit. p. 568.—Linn. Trans. vol. viii. p. 64.—TURT. Conch. Diction. p. 28, f. 12.—TURT. Dithyra Brit. p. 181.—FLEM. Brit. Anim. p. 421.—Brit. Marine Conch. p. 95.—BROWN. Illust. Conch. G. B. p. 87, pl. 34, f. 9.—CHEMN. Conch. Cab. vol. vi. pl. 17, f. 173. —DILLW. Recent Shells, vol. i. p. 117.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 397.—HANL. Recent Shells, p. 131.—PAYRAUD. Cat. Moll. Corse, p. 55.—PHILIPPI, Moll. Sicil. vol. i. p. 50, and vol. ii. p. 37.

,, *echinatum, var.* MONTAG. Test. Brit. p. 79, and Suppl. p. 33.

,, *tuberculare*, SOWERBY, Genera of Shells, Cardium, f. 3.

Encyclopéd. Méthodique, Vers, pl. 298, f. 3, and pl. 300, f. 1.

For thus introducing, under the name of *rusticum* (applied almost universally throughout England and France to an aberrant variety of the *Common Cockle*), a *Cardium* so generally known by the appellation of *tuberculatum*, some few words of explanation will be demanded. The original specimen of the *Cardium rusticum*, named by Linnæus himself, has been examined, and is precisely identical with the Mediterranean form of the species we are about to describe. The *C. tuberculatum* of Linnæus may or may not be ours, so indefinite is its description, and so erroneous its synonymy: we have preferred, then (since one or the other name must be expunged), the preservation of that which we have ascertained to be correct.*

This large species is of a somewhat rounded heart-shape, and is usually oblique, but varies much in outline from the greater or lesser flattening of the hinder dorsal area, which being rounded in the young, the contour is then rather square, but becomes occasionally subtriangular in the aged, from the hinder compression so usual at that stage of growth. The valves are very tumid, opaque, solid, and often ponderous; the convexity is evenly diffused, being most manifest subcentrally, and then gradually diminishing towards the sides and lower margin. The external surface, which is somewhat glossy, and tinged with rufous or reddish brown, occasionally adorned with deeper zones of the same hue, is rayed with about twenty-two strong ribs, which are separated, except in front, by interstices of at least equal breadth to them. The ribs are broad, well raised, somewhat square-topped, and armed with rather close-set, unconnected small knobs or tubercles, which, in full-grown perfect individuals, are present on all of them, and occupy the middle of their surface only, becoming more pointed on the posterior ones, and more obtuse large and broad on the anterior ones. The interstitial spaces, which are proportionately narrower in front, are concentrically traversed by most crowded and irregularly-flexuous narrow ridges or elevated sulci, which likewise ascend the sides of the ribs, and in the younger examples actually surmount them. The tubercles (which, in a variety now before us, are large and spinous, but not, as in *echinatum*, laterally compressed and radiatingly linked to each other) are usually more or less tinged with brown, and seated on a shallow groove, which appears to connect them ; but in aged specimens this is wont to become obsolete, and the knobs to be converted into concentrically linear strong scale-like protuberances towards the ventral margin. This latter, in the adult, is by no means arcuated in the middle, but curving out and obliquely ascending in front, (far more than equal to the downward inclination of the upper edge,) attenuates below the rounded extremity of the anterior side. It rises too posteriorly, but only sufficient to round off a little the inferior angle of that side. The hinder margin, although arcuated in the young, loses much of its convexity, or becomes straightish and occasionally subretuse in the mature shell, and is then moreover decidedly oblique. The declination of the dorsal edges is extremely trifling ; the front one, however, slopes the most ; their want of convexity causes a more or less indistinct angulation at the upper posterior corner, and prevents, likewise, the symmetrical rounding of the front one. The umbones are prominent, and nearly central in the young, but in the adult are distant from the anterior extremity only about two-fifths of the entire length of the valves. The beaks are greatly inflected, and slightly incline forward ; no defined lunule precedes them, but there exists in the mature shell a flattened area with subreflected lips, which is devoid of costæ, and often stained with a darker tint. The ligament is large and projecting : the umbonal slope is but little angulated. Internally the colour is white, with occasionally a rufous tint on the profundity of the valves, but no stain of brown either upon the hinge-margin, or at the posterior termination. The ribs on the inside extend only half way to the beaks. The lateral teeth are moderately remote and subequidistant ; the front one is large and strong.

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* For a more detailed account of the *Cardium tuberculatum* of Linnæus, see the "Ipsa Linnæi Conchylia" of Mr. Hanley, now in preparation for the press.

We cannot feel surprised that our British conchologists have not hitherto recognized the identity of our *C. tuberculatum* with the *rusticum* of the Mediterranean, as the ordinary state in which the latter usually reaches us, destitute of knobs, and beautifully zoned with a rich brown on a whitish ground (our own variety is generally of an uniform pale rufous), would not, until actual comparison, induce the supposition of their identity. The shape of the Mediterranean examples is frequently much more abbreviated than ours, so that the breadth almost equals the length, and the interstitial rugæ are perhaps less irregularly flexuous; but in no essential characters, do they differ from those which are indigenous to our coast.

Individuals rarely exceed two inches and three quarters in length, and a trifle less in breadth. The young bear but little resemblance to the fry of *echinatum* or *aculeatum*, being solid (even when less in diameter than half an inch), and armed with minute tubercles, instead of compressed lancet-shaped spines. According to Turton, they are of a chocolate-brown, with white blotches or rays; the first stage of growth, however, in our own shells, is pure white. The animal is figured and described by Poli; the mantle is thickened and denticulated posteriorly; tubes cirrhated, and with the mantle of a yellow or red colour; the foot long and crimson.

As a British species it is essentially local, and by no means frequent in collections. These shells, however, abound at certain seasons "On the Paignton sands in Torbay, where at low spring-tides they may be observed, with the fringed tubes appearing just above the surface. The neighbouring cottagers gather them in baskets and panniers, and after cleansing them a few hours in cold spring-water, fry the fish in a batter made of crumbs of bread, producing a wholesome and savoury dish. The inhabitants call them *red noses*" (Turton). The loose valves are scattered along the Cornish shores, and in some places in abundance, as in Lantivet Bay, east of Fowey (Couch).

It is essentially a southern species, and ranges to the Canaries.

### C. EDULE, Linnæus.

Neither triangular, nor porcelain white; with radiating ribs, which are neither armed with spines nor tubercles.

Plate XXXII. Fig. 1 to 4, and (animal) Plate N. Fig. 5.

LISTER, Hist. Conch. pl. 334, f. 171.

*Cardium edule*, LINN. Syst. Nat. ed. 12, p. 1124.—PENN. Brit. Zool. vol. iv. p. 91, pl. 50, f. 41.—PULTENEY, Hutchins, Hist. Dorset, p. 30.—DONOV. Brit. Shells, vol. iv. p. 124, f. 1.—MONT. Test. Brit. p. 76.—Linn. Trans. vol. viii. p. 65.—Dorset Catalog. p. 32, pl. 11, f. 1.—TURT. Conch. Diction. p. 30.—TURT. Dithyra Brit. p. 188.—FLEM. Brit. Anim. p. 422.—COUCH, Cornish Fauna, part ii. p. 28.—MACGILLIV. Moll. Aberd. p. 272.—Brit. Marine Conch. p. 97.—BROWN, Illust. Conch. G. B. p. 87, pl. 35, f. 1 to 6.—CHEMN. Conch. Cab. vol. vi. p. 198, pl. 19, f. 194.—WOOD, General Conch. p. 226, pl. 55, f. 4.—DILLW. Recent Shells, vol. i. p. 127.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 406.—Index Testaceolog. pl. 5, f. 26.—Rees' Cyclopædia, pl. 5.—CUV. Règne Animal (ed. Croch.), pl. 99, f. 4.—HANL. Recent Shells, vol. i. p. 134, pl. 5, f. 26.—REEVE, Conch. Iconica, Cardium, pl. 4, f. 22.

„ *vulgare*, DA COSTA, Brit. Conch. p. 180, pl. 11, f. 1.

„ *crenulatum*, LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 407.—DELES. Rec. Coquilles, pl. 11, f. 5.—REEVE, Conch. Iconica, Cardium, pl. 20, f. 112.

„ *pectinatum*, LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 405.—HANL. Recent Shells, vol. i. p. 134.

„ *arcuatum*. REEVE (not Mont.), Conch. Icon. Cardium, pl. 22, f. 33.

„ *zonatum*, BROWN, Illust. Conch. G. B. p. 88, pl. 35, f. 8.

„ *obliquum*, WOODWARD, Geol. Norf. pl. ii. f. 19 (fossil).

Encyclop. Méthod. Vers, pl. 300, f. 5.

So different is the outline of the aged Cockle from that of the nearly mature one, that, in despite of the extreme commonness of the shells, which offers every facility for ascertaining the exact extent of the species, the latter state has been separated by Lamarck, and some of his followers, as a distinct species, under the name of *C. crenulatum.*

The shape of the adult Cockle is subovate and subcordate, ranging occasionally to subtrigonal and suborbicular; in the latter case, the valves, which are always ventricose and typically inequilateral, become eminently swollen, and nearly equilateral. The texture is opaque, solid (occasionally ponderous), and of a squalid white, frequently with a ferruginous cast, but never marbled nor variegated externally.

The outer surface is dull, and occasionally covered in part with an ashy-olive fugacious epidermis, usually confined, however, to the posterior end, and the vicinity of the lower margin. About twenty to twenty-six radiating ribs are visible, which are tolerably evenly diffused over the entire surface; the two or three which cover the ordinary site of an umbonal ridge are, however, rather the largest, and the succeeding ones decidedly the narrowest of the series. These ribs are but little elevated (the terminal ones are, indeed, greatly depressed), and only separated from each other, in the more characteristic examples, by narrow grooves on the central disk, and concave (not square cut), rather broader ones at the sides. Crowded and slightly-curved linear elevations concentrically traverse the summit of the ribs, but become obsolete upon the posterior ones. The ventral edge, which is always more or less curved, and occasionally much arcuated, usually displays less convexity behind than in front, where it ascends with a bold sweep, forming a well-rounded and not very broad anterior extremity. The dorsal edges are straightish, or even subretuse, and decline but in a trifling degree; the posterior edge after forming a slight angle with the dorsal margin, slopes somewhat obliquely, and makes with the ventral a rounded-off inferior angle to the hinder side, which is occasionally much produced, and tapering at its extremity, occasionally broad, subbiangulated, and scarcely longer than the front one. The umbones are greatly prominent, and the beaks very acute, and much inflected.

The ligament is very large, and highly projecting. The interior is white, with a dark-chestnut stain at the posterior extremity, and often a still deeper one on the hinder hinge-margin. The lateral teeth are strong, much elevated, not very remote, and nearly equidistant.

If we take an earlier stage of this bivalve, for instance, an example not exceeding three-fourths of an inch in length, we shall perceive many and important differences, but such as may be traced up in regular gradation to the mature shell. The shape is then suborbicular, the sides equal or nearly so, there being no inferior hinder angle ; an upper posterior subangulation is, however, distinctly visible, and the hinder outline is more or less convex, and scarcely oblique. The ribs are rather more elevated, and all of them adorned with the linear scales (which, however, are very easily worn away), and flexuous livid zones occasionally make their appearance on the umbonal region.

Although apparently differing from *edule* quite as essentially as many of the more recently established species of *Cardium* do from each other ; yet, as we are able to appreciate in the *rusticum* of British writers the modifications of form, sculpture, and colouring, produced by a greater or lesser admixture of fresh water with the saline element, we venture not to describe it as specifically distinct, but hold it rather as a remarkably aberrant variety of the Common Cockle.

*Cardium rusticum*, Chemn. (not Linn. nor Hanl.) Conch. Cab. vol. vi. pl. 19, f. 197.—Mont. Test. Brit. p. 569.—Donov. Brit. Shells, vol. iv. pl. 124, f. 2.—Poli, Test. Sicil. pl. 17, f. 12, 13. —Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 405.—Deshayes, Elem. Conch. pl. 25, f. 1 (good).—Philippi, Moll. Sicil. vol. i. p. 52, pl. 4, f. 12, 13, 14, and vol. ii. p. 38.
„ *glaucum*, Brugiere, Encycl. Méthod. Vers, vol. i. p. 221.—Poiret, Voyage Barbarie, vol. ii. p. 13.—Wood, General Conch. p. 218.—Dillw. Recent Shells, vol. i. p. 130.—Hanl. Recent Shells, suppl. pl. 17, f. 36.
„ *Lamarckii*, Reeve, Conch. Iconica, Cardium, pl. 18, f. 93.
„ *Belticum*, Reeve, Conch. Iconica, Cardium, pl. 20, f. 113.
„ *edule*, Brown, Illust. Conch. G. B. pl. 35, f. 7.—Philippi, Moll. Sicil. vol. i. p. 52, and vol. ii. p. 39.

The contour is still more variable than in the typical form, being not only irregular in the degree of elongation of the posterior side, which is sometimes much produced, but also exhibiting at times an obliquity which is by no means constant. The valves at all stages are thinner and more swollen than those of the type, and have their ribs much more elevated, convex, and separated from each other by broader interstices. The linear concentrically-disposed scales have a great tendency to become obsolete, and are usually only visible, if at all, near the front extremity and towards the ventral margin, where, if present, they are generally crowdedly arranged. The hinder side, and very frequently the umbonal region, is stained with bluish smoke-colour or livid brown, which latter tint more or less prevails over the interior surface likewise. Ordinarily, but not invariably, the shape is more elongated than in the marine shells, and the front, and not the hinder dorsal margin, is the more elevated, so that the anterior side becomes proportionately higher. The umbones are broad, and extraordinarily tumid; the ligament is decidedly smaller than in the ordinary variety. The posterior ventral margin seems always rounded off.

The collective amount of these differences is very great; but all are rarely developed in the same specimen, since this variety approaches to or recedes from the typical form in proportion to the influx of salt-water into the brackish stream in which it is engendered. Some very beautiful ones, whose glossy surface is of a pale sulphur colour, are obtained in the vicinity of Hastings (S. H.). The salt-water marshes of Hampshire (Dr. Goodall); Arran, in Ireland (Ball); the Murray Frith (M'Andrew), &c., may also be indicated as localities.

The edible Cockle seems met with in most parts of the United Kingdoms, and is almost everywhere regarded as a savoury food by the humbler classes of society. The ordinary run of examples does not exceed an inch and four-fifths in length, and an inch and a half in breadth; but individuals of far more ample proportions are procured on the north coast of Devon (Jeffreys); the Scilly Isles (M'Andrew); and in the Hebrides (Barlee).

The animal of the common Cockle is shaped like its shell, thick, subglobose, and white. The mantle is of a yellowish hue, and differs from that of many of its allies in having a considerable portion of its edges more or less fimbriated, and also being furnished with a short white filament opposite each rib of the shell. The siphonal tubes are short and slightly separated, the branchial largest, and has its orifice fringed with about ten long white cirrhi, and two or three intermediate small ones between each pair. A reddish-brown hue encircles it, as also the anal siphon, which, however, has no cirrhi on its border: the usual tubular anal valve is conspicuous. The sides of the siphons are variable in colour, white, yellow, or brownish-red, sometimes speckled with black spots or markings, and they are clothed with scattered filaments, as well as the mantle near their bases. The foot is long and cylindrical, but not so large in proportion to the shell as in most of the *Cardia*, geniculated, and of a white or yellow colour, passing to a deeper hue, often brown or light orange towards its somewhat lanceolate extremity. The branchiæ are pale-brown and suboval, the upper laminæ being smallest; and the palps are triangular, rather long, acute, and of a reddish-brown hue.

The edible Cockle is a gregarious animal, inhabiting sands at low-water, and met with on most parts of our coast, especially where there are sufficient tracts of sand, and in the neighbourhood of estuaries; though the largest specimens are chiefly found away from the influence of fresh water, as in the Scilly Isles (M'Andrew), the north coast of Devon (Jeffreys), the Hebrides, and Zetland. The variety most common in our markets rarely exceeds an inch and four-fifths in length by an inch and a half in breadth, and comes, in most cases, from estuary sands, those of the Mersey being especially prolific. Everywhere this excellent mollusk is sought after for food, and it is one of the most savoury of its tribe; indeed, preferred by many persons to the oyster. It is equally good raw and cooked, dressed either by roasting or boiling, and gives a delicious flavour to fish sauce. Cockles are also often pickled, as the readers of Ingoldsby's treasured story of the Bald-headed Jackdaw will not readily forget. In times of scarcity they have afforded valuable supplies of food for the poor, and in the Zetland Isles bushels of their shells may be seen near cottages. Lieut. Thomas informs us that in Sanda, among the Orkney Isles, during the late failure of the potato crop, many of the poorer people subsisted almost entirely on Cockles.

Cockles found in coarse-bedded sands in the neighbourhood of tide-ways are often much thicker in the shell than those of confined and sheltered localities. A note, communicated by Mr. R. Ball, on the Arran (Ireland) variety, already mentioned, is illustrative of this. "In 1834," writes that accomplished naturalist, "when visiting the Great South Arran, in company with Mr. Thompson, we found an interesting variety of *Cardium edule* in a brackish lake at the northern end of the island. The shells were remarkably thin and brittle; the animals were not buried in sand, but appeared to inhabit the *Conferva crassa*, in which the majority of specimens were found creeping about. I supposed that the thinness of the shell was occasioned by the influence of the fresh water, but finding that the Cockles of the brine-pits are equally thin, this notion must be given up: the probability is, that the cause depends on the quiescent habitat. The greater number of specimens were very small, about a quarter of an inch in diameter a few larger examples were found on the shore of the lake; they were associated with a very produced variety of *Littorina jugosa*."

*Cardium edule* has a wide range, extending southward to the Canary Isles, and a Cockle which cannot be distinguished from it occurs in the Caspian Sea. In the Arctic seas it is replaced and represented by the *Cardium Islandicum*. As a fossil it is known in the Red Crag.

### C. NODOSUM, Turton.

Small, never porcelain white, nor marked with coloured bands; ribs about twenty-seven in number, all armed with scaly tubercles.

Plate XXXII. fig. 7.

*Cardium nodosum*, TURTON (not Montagu, Maton and Rackett, nor Wood) Dithyra Brit. p. 186, pl. 13, f. 8.—HANL. Recent Shells, 136, suppl. pl. 17, f. 44 (copied from last).—LOVÉN, Moll. Skandin. p. 36.—REEVE, Conch. Iconica, Cardium, pl. 22, f. 128.

„ *scabrum*, PHILIPPI, Moll. Sicil. vol. ii. pl. 14, f. 16.—HANL. Recent Shells, Suppl. pl. 17, f. 43.

The shape is suborbicular, subrectangular at the beaks, and rather wide below. The valves are moderately ventricose, the convexity being rather evenly diffused, and gradually diminishing from the umbones; they are more or less strong, opaque, and usually of an uniform rather squalid white or pale cream colour, and very rarely stained with orange or pink upon the umbonal region. The surface is entirely radiated over with about twenty-eight narrow moderately-elevated ribs, separated by still narrower deeply-cut interstices: these ribs are most crowdedly set with squamular tubercles, which, in different individuals, vary in shape, from suborbicular to linear sublunate, and have a tendency to become depressed in front, and spinous behind upon the posterior area; which latter is distinctly flattened, but its commencement is not indicated by any peculiarly sharp angulation. The ventral margin is moderately arcuated, and ascends in front, where the convexity is more decided. The degree of convexity and of declination in the dorsal edges is but trifling; the hinder one is decidedly the more sloping. The sides are nearly equal, the front being, in general, rather the shorter, and being broad and rounded both above and below at its extremity. The hinder termination is likewise broad, and very indistinctly sub-biangulated, the lower angle being a right or an obtuse one, and the upper being usually rounded off. The lunular depression, when present, is very narrow: the ligament is neither remarkable for size nor projection. The umbones are not particularly prominent, and the beaks are tolerably acute, and scarcely inclined forward. The colouring of the inner surface is similar to that of the external; in a single immature specimen, however, from Guernsey, which is of a pale pink without, the internal disk is of a deep rose-colour. The lateral teeth are nearly equidistant from the primary ones. A large specimen will occasionally attain to almost half an inch in length, and a trifle less in breadth; but the majority of examples are of lesser proportions.

It is difficult to account for so generally diffused a species having escaped observation until the publication of the "Dithyra Britannica" of Dr. Turton; since but little reasonable doubt can be entertained that this is not the *C. nodosum* of Montagu, which is described as being three quarters of an inch in diameter, and of a flattened shape. The language, indeed, of that author accords far better with the young of *tuberculatum*, of which species a tablet of immature individuals, supposed to have once formed part of the Colonel's collection, exists, thus named in our national Museum.

"Animal suborbicular, mantle white, open, clothed with white pointed filaments, corresponding to the ribs of the shell. The tubes are very short, pale yellow, each with ten or twelve flaky white cirrhi at their extremities, and red points at their bases, besides longer wavy white filaments above and below, and on them. The anal orifice has the usual tubular valve. The foot is white, moderately long, and finger-shaped, with a slight bend or elbow. There are a pair of subsemicircular branchiæ on each side, strongly pectinated on the upper, and less so on the under, surfaces. The upper branchiæ are very small, not half the length and depth of the under ones. Two very small triangular palpi on each side, pectinated in a similar manner with the branchiæ."—CLARK MSS.

This little cockle is chiefly an inhabitant of the laminarian zone, though it ranges far into the coralline occasionally. It frequents weedy and gravelly bottoms, and can scarcely be regarded as a common species. On the south coast it occurs at Weymouth (S. H.); in fifteen fathoms, off Portland (M'Andrew and E. F.); Exmouth (Clark); Torbay (S. H.); Falmouth and Fowey (Alder). Mr. Bean finds it at Scarborough, and Mr. Alder in Northumberland. In Scotland it is frequent in the Hebrides (Jeffreys and Barlee); Stornoway, four fathoms, sand, and Zetland as deep as eighty fathoms (M'Andrew). It is one of the species found by Captain Beechey in the ravine more than one hundred fathoms deep, between Ireland and the Mull of Galloway. It is common among weed, in from three to ten fathoms, in Clew Bay, and similar localities on the west coast of Ireland; and Mr. Thompson notes it as inhabiting both sides, "generally in deeper water than *Cardium pygmæum*." Bantry Bay (Humphreys).

It ranges from the shores of Norway to the Mediterranean.

### C. FASCIATUM, Montagu.

Small, thin, oblique; ribs scarcely raised, only divided from each other by linear spaces, the central ones devoid of sculpture, the hinder ones prickly: umbonal slope not angulated.

Plate XXXII. fig. 5, and (Animal) Plate N. fig. 4.

*Cardium fasciatum*, MONT. (not Gmel.) Test. Brit. Suppl. p. 30, pl. 27, f. 6.—TURT. Conch. Diction. p. 32.—FLEM. Brit. Anim. p. 422.—Brit. Marine Conch. p. 98.—BROWN, Illust. Conch. G. B., p. 88, pl. 35, f. 11.—WOOD, General Conch. p. 215.—DILLW. Recent Shells, vol. i. p. 130.—REEVE, Conch. Iconica, Cardium, pl. 21, f. 118.—LOVÉN, Moll. Skandinaviæ, p. 35 (from specimens).

,, *elongatum* (not of Bruguiere, 1792), MONT. Test. Brit. p. 82! (fide Turton, &c.)—Linn. Trans. vol. viii. p. 67 (from Mont.)—TURT. Conch. Diction. p. 31 (do).—WOOD, General Conch. p. 214 (do.).—DILLW. Recent Shells, vol. i. p. 131 (do.).—TURT. Dithyra Brit. p. 185, pl. 13, f. 9.—FLEM. Brit. Anim. p. 422.

,, *ovale*, SOWERBY, in Conchol. Illust. Cardium, No. 24.—HANL. Recent Shells, voi. i. p. 136, suppl. pl. 17, f. 45.—REEVE, Conch. Iconica, Cardium, pl. 21, f. 119.

,, *obovale*, Brit. Marine Conch. p. 96 (error for *ovale*).

,, *parvum*, PHILIPPI, Moll. Sicil. vol. ii, p. 39?

,, *rubrum* (young), REEVE, Conch. Iconica, Cardium, pl. 22, f. 124.

The shell which we have figured and described is undeniably the *C. elongatum* of Turton's quarto, of which the young state alone agrees with the *C. fasciatum* of Montagu. The language of the author of the "Testacea Britannica" (who terms it compressed, and allows it but twenty-one ribs) would not, in our opinion, warrant the identification of his *elongatum* with the bivalve now before us; but as the original inadequate description is unaccompanied by any figure which might enlighten us as to what was actually intended, and the type has been vainly sought for in the National Museum (whither the chief part of his collection was sent after his decease), we have yielded, though not silently, to the dictum of Turton, who probably founded his recognition on some original types which are no longer accessible. The name *ovale* was only introduced to remedy the pre-occupation of the epithet *elongatum* by a magnificent exotic species; *fasciatum*, notwithstanding its having been already bestowed on a *Cardium*, is allowable, since Gmelin has merely used it to designate a wretched figure of Knorr's, from which drawing solely he has derived his bald and undefining diagnosis.

The form is more or less oblique and oboval, with, at times, a tendency to be heart-shaped; at times, to be subquadrate. The texture is thin and fragile, but not at all diaphanous, and the valves are more or less ventricose. The colouring is white, with often a slight livid tinge, and almost invariably with short concentric bands of undulated brown streaks, which do not traverse the entire shell but are confined, excepting near the beaks, to the posterior side. These bands, moreover, are less evident and more livid in the adult; but even when almost obsolete externally, their presence may be traced in the interior. The surface is divided by about twenty-six radiating ribs, which are by no means prominent, the central being scarcely raised in the slightest, and merely a little convex, and those at the sides, with the exception of a few rounded ones upon the umbonal ridge (which is very oblique and rendered tolerably distinct by the surface being flattened behind it), are at most convex. The central ribs (except in the fry) are smooth and unarmed; but the lateral are sculptured by oblique tubercles, of which those upon the front ones are rather depressed, linear, crowded, transversely occupying the entire surface, and sloping down anteriorward; those upon the hinder ones are elevated horizontally subsquamular, more or less compressed, close-set, sloping down posteriorwards, and not extending transversely over the entire ribs. The interstitial lines, separating the ribs from each other, are extremely delicate near the middle of the valves, and even at their extremities are still very narrow; these lateral ones are traversed by slightly-elevated crowded concentric wrinkles, which are sometimes slightly indicated at the base of even the central striæ. The ventral margin is much arcuated, greatly ascending at its posterior termination (and thus narrowing the shell at that extremity), and not straightened in front. The anterior dorsal edge declines but moderately, and is a little convex; the posterior dorsal edge is very short, very slightly convex, and slopes downwards in a very trifling degree. The posterior outline is barely convex, and the extremity, though a little rhomboidal, is rounded both above and below; the front extremity is likewise rounded, but is a little angular above. The beaks are situated much nearer to the posterior end, to which they usually lean, and are acute and moderately projecting. There is no trace of a lunule, and the ligament is very small, narrow, and only slightly prominent. The interior partakes of the external colouring; the lateral teeth are of moderate size, and subequidistant; the front one is rather the more approximate.

It is intermediate between *C. nodosum* and *C. exiguum*, but is a far thinner shell than either of them. Its outline is much more oblique than the former, and its central ribs are devoid of the graceful sculpture which adorns the entire surface of that species. It more closely approaches the latter, but its convexity is more evenly diffused, its umbonal ridge not sharply angulated, and its ribs more numerous and less elevated. These, in *exiguum*, are separated from each other by far wider grooves, which are all traversed by concentric wrinkles; that shell, moreover, is much more angular in outline, has a slight lunule, with its front costal tubercles roundish and not linear.

The length of a full-sized example is not quite half an inch; its breadth is three-eighths of an inch.

The animal is shaped like the shell, and entirely white, with semi-opaque or flaky specks. The mantle is plain at the margins. The tubes are not extended beyond the eighth or fourth of an inch; they are equal and united; the anterior one has a distinct border of about ten cirrhi, which is not so evident around the anal siphon. Their sides, and the mantle near their bases, are furnished with longer filaments. The foot is long, securiform, and hyaline. "The branchiæ," according to Mr. Clark, "are subsemicircular, pale brown, the upper not half the size of the lower, strongly striated on the outside, smoother within; the pair of palps are very short, triangular, and pointed; striated on the outer, and much less so on the inner surface. The liver is green and placed very anteriorly; the ovarium is white."

This is one of our rarer *Cardia*, and is more frequently procured dead and worn than, in its perfect condition, armed with the caducous sculpture of its posterior area. We suspect that the *Cardium fasciatum* of Montagu (Test. Brit. Suppl. p. 30, pl. 27, fig. 6), was established from a young worn example of this species; at least, the figure and description agree better with that stage of the shell in which the flexuous chestnut bands occupy nearly the entire surface, than with any other cockle known to inhabit the British seas. On our southern coasts it occurs in from fifteen to twenty-seven fathoms off Portland, and in twenty to twenty-seven fathoms off Penzance (M'Andrew and E. F.); Torbay (S. H.); Whitesand

Bay (Jeffreys); and Exmouth offing, seven miles from land (Clark). On the east coast it is taken at Scarborough (Bean), and is locally abundant on the Northumberland and Durham coasts (Alder). It is rare in the Irish Sea. Dredged very sparingly in Belfast Bay and Strangford Lough in from six to ten fathoms, by Mr. Hyndman and Mr. Thompson. Portmarnock (Warren); Birterbuy Bay (Barlee); Bantry Bay (Humphreys). On the west coast of Scotland it is frequent, occurring chiefly in from fifteen to thirty fathoms, as at Oban, Skye, and Loch Fyne (M'Andrew and E. F.). Mr. Jeffreys and Mr. Barlee have taken it in many places among the Hebrides. Off the coast of Zetland it ranges from shallow water to considerable depths, occurring near shore in from five to ten fathoms, and on the Ling banks, thirty or forty miles from land, in fifty fathoms (M'Andrew and E. F.).

It ranges to the Norwegian Seas (Lovén). As a fossil it dates back as far as the epoch of the Coralline Crag (Searles Wood).

### C. PYGMÆUM, Donovan.

Small, subrhomboidal, very inequilateral, compressed in front, ventricose, and sharply angulated at the umbonal ridge: front extremity narrow and angulated; hinder extremity very broad, and biangulated.

Plate XXXII. fig. 8, and (Animal) plate N. fig. 2.

LIST. Historia Conch. pl. 317, f. 154.

*Cardium pygmæum*, DONOV. Brit. Shells, vol. i. pl. 32, f. 3.

„ *exiguum*, MONT. Test. Brit. p. 82.—Linn. Trans. vol. viii. p. 61.—Dorset Catalogue, p. 31, pl. 2, f. 11.—TURT. Conch. Diction. p. 31.—TURT. Dithyra Brit. p. 186.—FLEM. Brit. Anim. p. 422.—MACGILLIVRAY, Moll. Aberd. p. 273.—Brit. Marine Conch. p. 97.—BROWN, Illust. Conch. G. B. p. 88.—WOOD, General Conch. p. 212.—DILLW. Recent Shells, vol. i. p. 114.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 408.—PHILIPPI, Moll. Sicil. vol. i. p. 51, and vol. ii. p. 38.—HANL. Recent Shells, p. 135.—REEVE, Conch. Iconica, Cardium, pl. 21, f. 121.

Although Gmelin's name, *exiguum*, is prior to that of Donovan, yet as his species was merely constructed from the figure in Lister, and inadequately defined, it has no just claim to precedence.

There is a something so marked in the general outline and moulding of this peculiarly angulated cockle, that a hasty glance at even a worn and discoloured valve will enable us to discriminate it from its British congeners.

The contour is rhomboidal, with the hinder dorsal edge so extremely short, that, excluding the umbones, the shape may be termed triangular. The hinder dorsal area, which is broad and abruptly flattened, is defined in front by the extremely oblique and sharply-angulated umbonal ridge, at which point is the greatest tumidity of the valves, which, gradually decreasing in convexity, become compressed at the anterior extremity. The external surface is destitute of lustre, and of a white, or dirty-whitish hue, marked occasionally with interrupted irregular bands of brownish rufous spots, which are more perceptible towards and upon the umbonal ridge. Although the shell is small, its texture nevertheless is solid and opaque; the entire area is occupied by from twenty to twenty-two radiating ribs, which are rather broad, not much elevated, and divided from each other by distinct sulci, which become much wider at the hinder extremity. These interstitial sulci are concentrically punctated with impressed dots or lines, and the ribs themselves are armed with close-set coarse roundish nodules, which in the young pervade the entire surface, but in the more aged individuals are confined to the front of the shell and the portion bordering upon the ventral margin, the remainder gradually becoming obsolete, or wearing off as age advances. The ventral edge, which ascends most remarkably in front, displays but little convexity behind, scarcely rising from the central arch on that side of the shell. The front dorsal edge is straight or subretuse, and slopes most rapidly, forming a distant subcentral angle with the upturned ventral. The hinder dorsal edge, which is also straight, becoming a little rounded at the extremity, instead of declining, rises a little. The posterior margin is almost straight, and when young is comparatively perpendicular, becoming more oblique with age. The front extremity is very narrow, the hinder is very broad and biangulated. The umbones are very prominent; the beaks are much inflected, and lie at about one-third the distance from the anterior end; in front of them is a rather large flattened lunule-like space, which is free from costæ: the ligament is almost imbedded. The internal surface is whitish, with usually chocolate stains on the hinge-margin, and a tinge of brown upon the hinder termination. The lateral teeth are large, the front are the more approximate. A large specimen before us has attained the amplitude of five-eighths of an inch in length, and nearly half an inch in breadth.

The animal partakes of the triangular form of the shell, and is much truncated posteriorly. The mantle is white, and plain in front, fringed with numerous white filaments about the bases of the siphonal orifices. The branchial aperture is larger than the anal, and surrounded by a border of about ten filaments, as many or more tawny streaks radiate from it, and there is a tinge of orange or tawny around the other orifice also. Both are usually nearly sessile. The foot is long, cylindrical, and large in proportion to the body; its base is tinged with tawny, the rest being white.

This species must be regarded on the whole as scarce, though found in many localities. Usually the number of specimens taken is but small. It inhabits chiefly the laminarian region, and is, perhaps, rather to be considered as more at home in southern than in northern localities. On the south coast it has been taken at Southampton and Portsmouth (Jeffreys); Weymouth (S. H.); Dartmouth, in seven fathoms (M'Andrew and E. F.); Torbay, Fowey, and Falmouth harbours,—at the last of which spots it is notable for size and frequency (Alder). Swansea (Jeffreys); Tenby (Lyons); and Milford Haven, in ten fathoms water (M'Andrew and E. F.), are Welsh localities. Mr. Jeffreys has found it at Scalloway and Lochs Torridon and Kihon, on the west coast of Scotland, and Mr. M'Andrew has taken it alive (a variety) in from five to ten fathoms water, in Balta Sound, Uist, Zetland, and dead in fifty fathoms off Cape Wrath. In Ireland, it has been dredged in Belfast and Strangford Loughs, in from four to ten fathoms on muddy and shelly ground (Hyndman and Thompson); and on the west coast, in Clew, Clifton, Killery, and Roundstone Bays, in from three to ten fathoms, weedy ground (R. Ball, W. Thompson, and E. F.); Bantry Bay and Cork Harbour (Humphreys).

It does not appear to range north of Britain, but extends southwards to the Mediterranean, and as far as the Ægean, where it is plentiful in from seven to thirty fathoms water, usually among weeds.

The *Cardium muricatulum* of authors (Mont. Test. Brit., p. 85,—Lin. Trans. vol. viii., p. 68,—Wood, General Conch., p. 215,—Dillwyn, Recent Shells, vol. i., p. 131,) is now generally regarded as the fry of this shell. It is a worthless species, solely constituted from a bad figure (84) in Walker's "Testacea Minuta Rariora," which bears about equal resemblance to the young of *Cardium nodosum.*

### C. SUECICUM, Reeve.

Small, thin, suborbicular, very inequilateral, both within and without of an uniform shining pure porcelain white; ribs about thirty, all armed with minute vaulted scales: ventral edge much arcuated; lower corners rounded.

Plate XXXII. fig. 6.

*Cardium Suediense*, REEVE (March. 1845), Conchol. Iconica, Cardium, pl. 22, f. 132.
„ *Loveni*, THOMPSON (May, 1845), Annals of Nat. Hist. vol. xv. p. 317, pl. 19, f. 7.
„ *Suecicum*, LOVÉN, Index Mollusc. Skandinaviæ, p. 36.

The shape of this rare and exquisite addition to our Fauna, which was first described as an Irish production, in the fifteenth volume of the "Annals of Natural History," by Mr. Thompson (whose appreciation of its newness to science was only anticipated by two months), is somewhat obliquely suborbicular, the length, in the younger specimens especially, somewhat exceeding the breadth. The valves are very inequilateral, thin, and delicate, but opaque, and of a pure and uniform lustrous porcelain white. Their convexity is not considerable, but tolerably evenly diffused, a little above the central disk being the most ventricose portion of the shell. The surface is shining, and radiated with about thirty rounded and not greatly-elevated ribs, all of which are armed in the middle with very small and crowded vaulted scales, and are separated from each other by mere linear interstices, which become rather narrower near the hinder extremity, and towards the beak appear, under a powerful magnifier, to be minutely punctated.

The ventral margin is arcuated in the middle, ascending more or less obliquely in front, and rising, although in a lesser degree, at the posterior side likewise. The front dorsal edge, in the younger examples, is very short, and not at all sloping, and forms a very obtuse angle with the but slightly convex anterior margin, which latter, as age advances, curves outward, when the angulation becomes no longer perceptible, and the front outline appears to form one uninterrupted sweep from the umbones to the ventral margin. The hinder dorsal edge is almost straight, almost equally devoid of declination, and forms at its termination a more or less rounded off angle with the curved posterior edge. The lower corner of the hinder side, which is very greatly the superior in length, is likewise rounded. The umbones are prominent; the beaks are acute, inflected, and lean a little towards the small and narrow impressed lunule; the ligament is small, and not at all projecting. The hinder dorsal area scarcely presents a trace of that flattening of surface so habitual in the genus; the umbonal ridge is consequently well rounded, and not strikingly manifested. The internal surface is of a pure unstained white, often shining with a slightly pearly lustre; the front lateral teeth are the more approximate. The length is almost one-third of an inch, and the breadth is very slightly inferior. The animal appears to be entirely white.

It is not alone the rarest of our Cockles, but one of our scarcer British shells, having been hitherto met with in scanty numbers, and out of Britain only in the Norwegian seas. The first recorded specimens are stated by Mr. Thompson to have been extracted from the stomachs of some common soles (*Solea vulgaris*), which had been caught off the eastern coast of Ireland, and exposed for sale in the Dublin market (Dr. Farren). Subsequently, a very few specimens were dredged off the South Rock, coast of Down, from the depth of fifty fathoms (Hyndman); and since the publication of the species, other examples have been obtained by Dr. Farren on the Irish coast, by Mr. Jeffreys from Oban and other parts of the western coasts of Scotland (Ann. Nat. Hist. 1847, p. 313), and by Mr. M'Andrew. The following localities, noted by the last-named naturalist, will serve to shew its range; Loch Fyne, in thirty fathoms, alive; the Minch, in fifty fathoms, dead; Cape Wrath, alive, in fifty-five fathoms, nine miles from land; and off East Noss, Zetland, thirty miles from land, in seventy fathoms, alive.

### C. NORVEGICUM, Spengler.

Large, oblong, smooth, or nearly ribless.

Plate XXXI. figs. 1 and 2, and (Animal) Plate N. fig. 1.

LISTER, Hist. Conch. pl. 332, f. 169.

*Cardium lævigatum* (not of Linnæus), PENN. Brit. Zool. ed. 4, vol. iv. p. 91, pl. 51, f. 40.—DA COSTA, Brit. Conch. p. 178, pl. 13, f. 6.—PULTENEY, in Hutchins, Dorset, p. 31.—DONOV. Brit. Shells, vol. ii. pl. 54.—MONT. Test. Brit. p. 80.—Linn. Trans. vol. viii. p. 65.—Dorset Catal. p. 31, pl. 7, f. 6.—TURT. Conch. Diction. p. 31.—TURT. Dithyra Brit. p. 190.—FLEM. Brit. Animals, p. 423.—MACGILL. Moll. Aberd. p. 273.—BROWN, Illust. Conch. G. B. p. 88, pl. 35, f. 12 to 15.—POLI, Test. Sicil. pl. 17, f. 10, 11.—WOOD, General Conch. p. 222 (not variety), pl. 54, f. 1.—DILLW. Recent Shells, vol. i. p. 123.—MAWE, Conchology, pl. 7, f. 7 (young).—PHILIPPI, Moll. Sicil. vol. i. p. 50, and vol. ii. p. 37.—HANL. Recent Shells, vol. i. p. 133.

„ *Norvegicum*, SPENGLER, Skrivt. Naturhis. Selskab. vol. v. part 1, p. 42.—LOVÉN, Index Moll. Skandinaviæ, p. 35.

„ *serratum*, LAM. (not Linn.) Anim. s. Vert. (ed. Desh.) vol. vi. p. 401.—Brit. Marine Conch. p. 99.—TURT. Dithyra Brit. p. 192, pl. 13, f. 5 (from type).

„ *oblongum*, BROWN (not of Chemnitz), Illust. Conch. G. B. p. 88, pl. 35, f. 16.—REEVE, Conch. Iconica, Cardium, pl. 15, f. 71.

*Cardium Pennantii*, Reeve, Conch. Iconica, Cardium, pl. 9, f. 48.
„ *vitellinum*, Reeve, Conch. Iconica, Cardium, pl. 7, f. 37.

The shape of the *C. norvegicum* is oblique and liable to great modification, ranging from broadly obovate and subventricose to subtriangular and tumid. The valves are very inequilateral, solid, opaque, and rather glossy, of a pale flesh-colour, spotted or subradiatingly speckled with a deeper tint of the same hue, and covered with an olivaceous drab or fawn-coloured epidermis, often becoming yellow near the margin. The surface is radiated with very narrow obsolete ribs, which gradually vanish in front, and cease upon the hinder dorsal area, which is but very moderately flattened. The ventral margin, which is but little rounded in the middle, is well arcuated on each side, and ascends rather the more obliquely and fully in front. The anterior side, which is very considerably the lesser one, has its extremity rounded both above and below, with the front margin curving in an almost uninterrupted sweep from the ventral, so that the dorsal edge is only distinguishable by its greater straightness. The hinder dorsal margin, which is the more elevated, and whose slope is moderate and straightish, unites with the very oblique and but little convex posterior edge without any angulation. The hinder side is also rounded, and very projecting at the lower corner. The ligament is large and prominent ; the umbones are narrow and projecting ; and the beaks are acute and much inflected, hardly leaning to either side. There is no decided lunule, but instead of it a somewhat undefined lanceolate flattened surface, which in the young is usually elevated, and in the fry is coloured with crimson. The obsolete umbonal ridge is devoid of all angularity. The interior is whitish or pale flesh-colour, and the ventral margin is coarsely dentated. The lateral teeth are rather approximate and subequidistant, the front ones are very slightly the more approximate and broader than the hinder ones; the posterior of the left valve is very small.

Immature individuals are far more beautiful than the adult, the epidermis being extremely thin and transparent, permitting the livid red or flesh-coloured spots or speckles to be distinctly visible; their interior, likewise, is often adorned with a dull crimson-coloured stain on each side of the valves. The internal rib-like elevations of the ventral margin are generally divided by a narrow groove. The most magnificent examples we have ever beheld came from Bantry Bay, and measured three inches in length and two-and-a-half in breadth. The ordinary run of specimens does not greatly exceed two inches in length, and one-and-a-half in breadth.

We have frequently examined and delineated the animal, and have been favoured by Mr. Clark with his observations upon it. It is shaped as the shell, oval, and thick, and mostly of a white colour. The free edges of the mantle are plain, without filaments, and of a reddish-white or red-flesh colour, varying in intensity in different individuals, and bordered by white. The closed posterior portion is clothed with thick-set long filaments, either white, or pale yellow or reddish-brown. These are continued upon the slightly-produced siphons, which are white tinged with tawny near their orifices, or pale-yellow with flaky spots and lines. They are united at their bases, separate, and divergent at their extremities; the branchial tube is rather the shorter, though wider than the other, and has its orifice encircled by white cirrhi, about eight of which are longer than the others, and between each pair are three smaller ones. The anal siphon has a simple margin; a few small dark-brown dots surround the opening, which is furnished with a tubular hyaline valve; a faint brown line runs along its upper and lower surface. The foot is long and powerful, securiform, and thick, pointed at its extremity, of a red-flesh colour, except its apex, which is white, and a margin, as it were, of fulvous hue. The coloured portion presents a shagreened aspect under the lens, and depends upon an exceedingly thin epidermis which is rubbed off by the slightest touch, exposing pure white below it. The branchiæ are of a pale brown colour and triangularly suboval shape, with fulvous or dark-brown margins and tips. The upper leaflets are smaller than the lower, and hang subvertically, with transverse striæ more visible on the outer than on the inner surfaces, being the reverse of the two palps on each side, which are smooth on the outer area, and striated within, triangular, very large, and pointed.

The *Cardium Norvegicum* lives on a sandy or gravelly bottom at a depth usually of from fifteen to thirty fathoms. Dead valves have been taken as deep as eighty fathoms, and are not unfrequently cast on shore by the waves. The dredge and the trawl are its most efficient captors, and it ranges to a considerable distance from land. It is not habitually gregarious, often solitary. It is very active, and capable, by means of its large and powerful foot, of effecting considerable leaps, often springing out of the vessel in which it is placed when in captivity. It is so generally (though often sparingly) distributed around our shores that we must consider it a common species, and need not enumerate localities, being absent from none of our local lists, either of eastern or western origin. Northwards it ranges to Norway, southwards to the Mediterranean; and as a fossil is known in deposits of pleistocene age.

### SPURIOUS.

*Cardium Grœnlandicum*, Chemn. Conch. Cab. vol. vi. p. 202, pl. 19, f. 198.—Spengl. Skrivt. Naturh. Selskab. vol. v. pt. 1. p. 46.—Speng. Magaz. Berlin, Gesel. Naturf. vol. ii. p. 126.—Wood, General Conch. p. 227.—Dillw. Recent Shells, vol. i. p. 129.—Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 407.—Index Testaceol. pl. 5, f. 28.—Gould, Invert. Massach. p. 92.—Hanl. Recent Shells, vol. i. p. 134.—Reeve, Conch. Iconica, Cardium, pl. 10, f. 53.—Dekay, New York Moll. p. 206, pl. 23, f. 250.

*Venus Islandica*, O. Fabr. Fauna Grænlandica, p. 411. (fide Möller.)

*Mactra radiata*, Donov. Brit. Shells, vol. v. pl. 161.—Linn. Trans. vol. viii. p. 69.—Turt. Conch. Diction. p. 80.—Dillw. Recent Shells, vol. i. p. 138.

*Cardium edentulum*, Mont. Test. Brit. Suppl. p. 29.—Flem. Brit. Animals, p. 423.—Sowerby, Genera of Shells, Cardium, f. 2.

*Aphrodita columba*, Lea, Americ. Phil. Trans. vol. v. p. 110, pl. 18, f. 54.

*A Boreal species; introduced by Donovan, as taken by Mr. Laskey, after a storm, on the shore near Portsmouth.*

### C. serratum, Linnæus.

*Cardium serratum*, Linn. Syst. Nat. ed. 12, p. 1123.—Flem. Brit. Anim. p. 423.—Chemn. Conch. Cab. vol. vi. p. 193, pl. 18, f. 189. —Dillw. Recent Shells, vol. i. p. 124.—Mawe, Conchology, pl. 7, f. 2.—Hanl. Recent Shells, vol. i. p. 133.—Reeve, Conch. Iconica, Cardium, pl. 1, f. 1.

„ *citrinum*, Wood, General Conch. p. 223, pl. 54, f. 3.

„ *lævigatum*, Spengler, Magaz. Berlin Gesel. Naturf. vol. ii. p. 125.—Brit. Marine Conch. p. 99.—Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 403.

*A West Indian shell, introduced by Dr. Fleming, as from the Pentland Frith, under the natural supposition that it was identical with Turton's species. The latter is a young variety of* Norvegicum.

### C. medium, Linnæus.

*Cardium medium*, Linn. Syst. Nat. p. 1122.—Donov. Brit. Shells, vol. i. pl. 32, f. 1.—Mont. Test. Brit. p. 83.—Linn. Trans. vol. viii. p. 61.—Turt. Conch. Diction. p. 32.—Flem. Brit. Anim. p.

422.—Chemn. Conch. Cab. vol. vi. p. 169, pl. 16. f. 162, 163.—Wood, General Conch. p. 211, pl. 50, f. 3.—Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 409.—Dillw. Recent Shells, vol. i. p. 113.—Mawe, Conchology, pl. 7, f. 1.—Hanl. Recent Shells, vol. i. p. 141.—Reeve, Conch. Iconica, Cardium, pl. 6, f. 30.

*A West Indian shell; introduced by Donovan as taken near Hartlepool, on the coast of Durham. The small specimen, with about fifty (!) ribs, stated in Turton's Dithyra (copied at p. 78 of the British Marine Conchology) to have been taken alive at Livermead, near Torquay, is evidently not this shell, and was, in all probability, only the young of* Venus ovata, *the fry of which closely resembles a small Cockle. Unfortunately, the original specimen is lost, and the description is inadequate for the determination of the species. In some local collections we find* Cardium pygmæum *preserved under this name.*

### C. MURICATUM, Linnæus.

*Cardium muricatum*, Linnæus, Syst. Nat. ed. 12, p. 1123.—Fleming, Brit. Anim. p. 421.—Chemn. Conch. Cab. vol. vi. p. 185, pl. 17, f. 177.—Bruguiere, Enc. Méthod. Vers. vol. i. p. 233.—Wood, General Conch. p. 216, pl. 51, f. 2, 3.—Dillw. Recent Shells, vol. i. p. 120.—Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 399.—Index Testaceolog. pl. 5, f. 14.—Hanley, Recent Shells, vol. i. p. 132, pl. 5, f. 14.—Reeve, Conch. Icon. Cardium, pl. 6, f. 33?

*A West Indian shell; introduced by Dr. Fleming, who received it from Dr. Coldstream as found at Leith, in Scotland. It had probably been transported in ballast.*

# LUCINIDÆ.

The mollusks composing this group exhibit shells which, in form, texture, and ornament, strikingly remind us of *Venus* and its tribe, whilst the animals seem more closely connected with *Kellia* and its minute allies. The former are equivalve, and usually more or less orbicular, their surfaces presenting all varieties of sculpture; in some being smooth, in others decussated or radiated by longitudinal ribs, or sulcated by concentric furrows, or scored by wavy markings disposed in elegant and regular patterns. The muscular scars of their interiors present features of generic importance, and the pallial impression is always entire. The animals have sessile siphons, unless the anal tube presented by certain *Lucinæ* be regarded as a true siphon; more probably, however, it is only a great development of the anal valve. They are sand or mud-inhabiting bivalves, ranging through all depths of water, some of them being littoral, others confined to the deepest explored abysses of the ocean. The genus *Corbis*, of which we have no living British examples, though during periods immeasurably distant its representatives inhabited our area, is a very beautiful and conspicuous member of this tribe.

The animals of several species of *Lucina* and that of *Corbis*, have furnished the subject of some valuable observations communicated by the eminent French zoologist, Valenciennes, to the Institute in 1845, and published in the "*Comptes rendus*" for that year.* "The family of *Lucinæ*," he states, "is composed of mollusca which have only a single branchial leaflet on each side of the visceral mass, and of the foot. This single branchia resembles that of the *Anodonta;* it is large, thick, and formed of pectinated and anastomosing lamellæ." This peculiarity was first observed by M. Valenciennes in the *Lucina Jamaicensis*, afterwards in *Lucina tigerina* (so long considered a *Venus* or *Cytherea*); also in *Lucina columbella* and in *Lucina lactea.* An examination of the animal of *Corbis* shewed that it also presented this curious feature, but was distinguished from *Lucina* by its non-perforated foot. He further discovered that in the *Lucinæ* the aperture of the mouth is very small, and surrounded with weak and thin folds of skin, being rudimentary lips. He confirmed the statements of Poli respecting the singular structure of the foot, and completed his description. "This foot," he states, "is a fleshy cylinder, folded back on itself so as to be hidden between the plates of the mantle of the mollusk, for it is frequently twice as long as the diameter of the animal. When not contracted, it is much longer. It is remarkable, that it is hollow throughout its entire length, and that this tube opens directly and widely into the spaces of the visceral cavity." There can be little doubt that the single gill accorded by M. Valenciennes is an organ similar to that observed by Professor Owen in *Pholadomya* and *Anatina*, viz., the two lamellæ of the same side so united as to appear like a single gill.

In conformity with general opinion, we place the genus *Diplodonta*, the species of which closely resemble, and were formerly associated with *Lucina* in this family, though, as will be seen hereafter, it differs in having the branchial lamellæ not united on each side, and the labial palps fully developed.

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* See also "Annals of Nat. History," vol. xvi. p. 41, where the paper is well translated.

## LUCINA. Brugiere.

Shell equivalve, orbicular, sub-compressed or tumid, regular, often nearly equilateral; surface smooth or concentrically striated, or ribbed in one or both directions, or marked with undulating or angular furrows; hinge very variable, usually presenting two diverging cardinal teeth and two laterals, but in many species one or both sets of teeth are more or less obliterated; ligament varying in position, chiefly external; muscular scars strongly marked, the anterior usually elongated; pallial impressions simple.

Animal orbicular, its mantle freely open in front, with plain or fimbriated edges; siphonal orifices sessile, the anal sometimes (always?) provided with a retractile produced tube (anal valve?). Foot very long, ligulate, tubular. Branchial leaflets of each side united into one; labial palps obsolete.

The assemblage of shells to which the name *Lucina* has been given by conchologists includes so many species, presenting striking dissimilarities in dentition and sculpture, that we are naturally tempted to separate them into distinct generic groups, and many appellations of proposed generic value have been given to their several supposed types. Unfortunately, however, our knowledge of the animals of the so-called *Lucinæ* is by no means commensurate with our acquaintance with their shells, and all that we do know would rather seem to warn us against the proposed divisions than to bear them out. It appears as if many important characters, which in other families afford almost unfailing sources of generic distinction, had in this been degraded to a specific position, and that features, usually of little consequence, had usurped their places. Until our knowledge of the tribe becomes much more minute and accurate than it now is, conchologists had better content themselves with using a single generic term, than, through a false ambition of becoming the parents of names, thrust worthless and embarrassing synonyms on a science already considerably encumbered with rubbish.

As far as external aspect goes, our *British Lucinæ* arrange themselves under several sections. Thus, *Lucina borealis*, the type of the genus, naturally associates itself with *L. spinifera* (which constituted the useless genus *Myrtea* of Turton). To this section, in which, so far as we know, the animal does not exhibit a prolonged anal tube, the name *Lucina* most especially belongs. The *Lucina lactea*, and its Mediterranean allies, nearly resemble the former; but appear to have, judging from the figures of Poli and Deshayes, a very much prolonged anal valve, or tube—this is the section *Loripes*. The *Lucina flexuosa* appears to have a very similar animal, though we have not observed its tube; its shell exhibits peculiarities of dentition which caused Turton to constitute his genus *Cryptodon*, Philippi his *Ptychina*, and Leach his *Thyasyra*. The fossil generic name *Axinus* had been given by Sowerby to a *Lucina* evidently of this group, from the London clay, though, as in many fossil genera, the founder seemed to have had a very indistinct notion as to wherein its generic claims and affinities lay. Generic names so founded can scarcely claim right of priority, any more than those of manuscript catalogues, such as the frequently quoted lists of Leach, the publication of one of which by Mr. Gray in the "Annals of Natural History," has not increased, but rather diminished the confidence of naturalists in their value. *Clausina*[*] of Jeffreys can scarcely claim separation from the section *Cryptodon*, though the minute shell for which it was founded presents striking resemblances to a *Kellia*. *Lucina divaricata* forms part of the genus *Strigilla* of Turton, and marks a section curious for the wavy lines sculpturing the surface of the shells it includes. Lastly, the pseudo-British *L. tigrina*, with its allies, constitute an assemblage equally remarkable for singularities of sculpture, but not the less presenting the essential and peculiar characters of *Lucinæ*. The name *Codakia* of Scopoli applies to this subdivision.

*Lucinæ* are distributed all over the world, and between thirty and forty existing species have been described. Nearly 150 fossil species are recorded from various formations, and they distinctly commenced their appearance early in the secondary epoch, and probably sooner. The elongated muscular scar is an excellent guide in determining casts of fossil *Lucinæ*, though itself by no means so constant in character throughout the genus as we could wish it to be.

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[*] The characters of his genus *Clausina*, as given by Mr. Jeffreys himself in the twentieth volume of the Annals of Natural History (July 1847) are as follows :—" Testa pygmæa, orbicularis aut longitudinaliter rotundato-ovata, globosa, subæquilateralis, æquivalvis, utrinque clausa, plerumque tegumine ferruginoso vestita. Cardo in utrâque valvula tuberculo et lamella laterali munitus. Apices subcentrales ; lunula nulla ; ligamentum externum. Impressiones musculares ut in *Cyprina*." Mr. Gray has strangely placed it among his *Tellinidæ*.

### L. BOREALIS, Linnæus.

Suborbicular; with raised concentric striæ.

Plate XXXV., fig. 5, and (Animal), Plate M. fig. 6.

*Venus borealis*, LINN. Syst. Nat. ed. 12, p. 1134 (from type).—DONOV. Brit. Shells, vol. iv. pl. 130.

*Tellina radula*, MONT. Test. Brit. p. 68.—LINN. Trans. vol. viii. p. 54.—TURT Conch. Diction. p. 175.—WOOD, General Conch. p. 183, pl. 42, f. 4, 5.—Index Testaceolog. pl. 4, f. 71.

*Lucina radula*, LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 225.—TURT. Dithyra Brit. p. 116.—FLEM. Brit. Anim. p. 441.—MACGILLIV. Moll. Aberd. p. 255.—Brit. Marine Conch. p. 73.—BROWN, Illust. Conch. G. B. p. 98, pl. 39, f. 8, 9.—PHILIPPI, Moll. Sicil. vol. i. p. 35, pl. 3, f. 17, and vol. ii. p. 25.—GOULD, Invert. Massach. p. 69.—HANL. Recent Shells, p. 75.

„ *alba*, (YOUNG) TURT. Dithyra Brit. p. 114, pl. 7, f. 6, 7.—Brit. Marine Conch. p. 72.

„ *antiquata*, (FOSSIL) SOW. Min. Conch. pl. 557, f. 2.

The substitution of the name *borealis* for the better known appellation of *radula*, is the result of an investigation of the Linnæan species, still preserved in the cabinet of the illustrious naturalist of the north. The contour of this thread-girt bivalve is very nearly orbicular, the length of the shell scarcely exceeding the breadth in the slightest degree. The valves, which are rather ventricose in the middle, but rapidly diminish in convexity towards the margin, and chiefly anteriorward, are of an uniform more or less pure white, and are covered in the adult with a delicate yellowish or ash-coloured epidermis. Acute membranaceous striæ, which are rather closely arranged in a concentric direction, and are more or less equidistant, render the entire surface rough to the touch; the interstitial spaces are not decussated, and there is no other sculpture or division of surface present, excepting an obscure shallow sulcus along the ordinary site of an umbonal ridge. The ventral margin is strongly arcuated, and usually, but not invariably, rises rather the more in front, thus causing the anterior side to be rather the less broad. The front dorsal edge is more or less retuse, and declines in but a trifling degree; the hinder dorsal edge is nearly straight, or hardly convex, and scarcely slopes at all. The anterior side, which exhibits a rounded off angle above, but not the slightest angulation below, is decidedly, but not so very greatly, the shorter; the posterior side is angulated above, and, similarly to the other side, is destitute, except in young individuals, of any inferior angulation. The umbones project but little; the beaks are acute, and lean a little forward; in front of them is a shallow lanceolate lunule. The ligament is broad and large, but not prominent, and is usually of a rather pale colour. The internal surface is of a more or less dull white; the hinder muscular scar is very large, and the margin perfectly free from crenation. There exists in each valve a bifid and a simple primary tooth, both of which are of moderate size; and in the right valve a very small not very distant anterior lateral one, which, however, is often very obscure.

The breadth of a fair-sized specimen was an inch and a half, which measurement was very slightly exceeded by its length.

We are indebted to Mr. Alder for a sketch of the animal of this species, one of the many obligations conferred on us by our much valued friend. It is accompanied by the following note: "I enclose you a drawing of *Lucina borealis*, made from specimens sent me by Mr. Embleton. During the ten days I kept them alive, they shewed no more than I have represented, from which I conclude that the two siphons are never exserted. The mantle is widely open in front, with the margins waved or plicated; there are two apertures behind, the upper one of which is the largest, but they do not appear to be produced into tubes, or exserted beyond the shell. The foot is long and strap-shaped or cylindrical in front, and capable of great extension; behind it is strong and slightly lunate. (The outline shews this as it appears when the shell is opened.) There is only a single branchial leaflet on each side. Rang says, that the mantle is fringed, but as far as I can see there are no filaments; he also says 'tubes courts et réunis,' which does not agree with this species."

This is by no means a common shell, though widely distributed around our coast, and in certain localities very abundant. It inhabits sandy ground in various depths, from near low-water mark down to ninety fathoms. In the south it occurs abundantly near St. Peter's Port in Guernsey (S. H.); Exmouth (Clark); Falmouth and other parts of Cornwall (Jeffreys and Alder); Scilly Isles (M'Andrew); Bristol Channel (Jeffreys); Milford Haven (M'Andrew and E. F.); Isle of Man in from twelve to twenty-five fathoms, and plentiful in places, as at Ballaugh and Derbyhaven (E. F.); Scarborough (Bean); Embleton Bay, Northumberland, at low water, plentiful (Embleton). In Scotland it occurs at Oban, and in many of the lochs of the Hebrides (Jeffreys); on the Zetland coasts frequent in muddy sand, from fifteen to ninety fathoms, and as far as thirty miles from shore (M'Andrew and E. F.); Moray Firth in from fifteen to thirty-four fathoms (M'Andrew); beyond low-water mark in sand at Stromza, Sanda, and elsewhere in the Orkneys (Thomas); Aberdeenshire (Macgillivray). "Widely distributed around the coast of Ireland, dredged in sand in from six to twelve fathoms in Belfast and Strangford loughs. Found by myself and Mr. R. Ball, in lakes of brackish water in largest of south isles of Arran 1834." (W. Thompson). Off Cape Clear in sixty fathoms (M'Andrew); Bantry Bay and Cork Harbour (Humphreys, Barlee).

It ranges to Finmark, and may be regarded as a characteristic Celtic shell. It is found fossil in both red and coralline crags, so can boast of a high antiquity within the British area. Gould enumerates it among the rarest shells of Massachusetts. Its comparative abundance on the eastern side of the Atlantic, and its presence there in ancient deposits, would seem to indicate that region as its place of birth as a species.

### L. SPINIFERA, Montagu.

Oval; with raised concentric striæ, which become spinous at the hinder dorsal termination.

Plate XXXV. fig. 1.

*Venus spinifera*, MONT. Test. Brit. p. 577, pl. 17, f. 1. — Linn. Trans. vol. viii. p. 78. — TURT. Conch. Diction. p. 231. — DILLW. Recent Shells, vol. i. p. 163.—Index Testaceolog. pl. 7, f. 11.
*Myrtea* „ TURT. Dithyra Brit. p. 133.—FLEM. Brit. Anim. p. 433.—BROWN, Illust. Conch. G. B. p. 98, pl. 36, f. 15, 16, and pl. 39, f. 14.
*Lucina Hiatelloides*, PHILIPPI, Moll. Sicil. vol. i. p. 32.
„ *spinifera*, Brit. Marine Conch. p. 74, f. 23.—MACGILLIV. Moll. Aberd. p. 255. ?—HANL. Recent Shells, vol. i. p. 78.—PHILIPPI, Moll. Sicil. vol. ii. p. 25.

There exists in the dorsal aspect of this elegant bivalve, its large and elongated ligament guarded with minute and crowded spinous projections, a *facies* which readily distinguishes it from its congeners, whether of native or foreign nativity. As to the general shape and sculpture, these are liable to extraordinary modification. Typically, the former may be stated to be oval, ranging through oboval to somewhat triangularly suborbicular; the length, however, most decidedly exceeds the breadth in all the numerous examples we have hitherto observed. The valves are rather strong, opaque, and of an uniform lustreless white; when young they are compressed, but in the more aged individuals are subcentrally (or rather higher than the middle of the disk) almost ventricose, rapidly diminishing, however, in convexity towards the margins. The surface is concentrically wrought with numerous extremely delicate laminar striæ, which typically are almost equidistant, and cover the entire area, but in some examples approximate towards the lower margin, or become obsolete upon the more swollen portion of the disk; occasionally too they are extremely fine and depressed, and most crowdedly, and sometimes irregularly disposed. These membranaceous lines (whose interstices are not visibly decussated), abruptly ceasing near the hinder dorsal edge, surround the smooth and flattened or slightly excavated lozenge (which is lanceolate, and pointed at both extremities) with a crest of small spinous protuberant scales formed in the younger specimens, and in the upper portion of the adult ones, by the confluence of each pair of striæ at their termination. The ventral margin, which is internally somewhat flattened and devoid of crenation, is moderately arcuated, and rises the more in front; its chief swell is a little before the middle. The dorsal edges vary from rather slightly to moderately sloping; the hinder one is convex, the front one is decidedly incurved. The umbones project but little, and are usually rather compressed towards the very small beaks, in front of which lies a rather large lanceolate sunken smooth-surfaced lunule. The anterior side is rather the shorter; its extremity, which is subangulated above, and well rounded below, is about equal in breadth to the subtruncated posterior termination; the short posterior margin, which is more or less straight and perpendicular, forms a decided angle with the upper, and a rounded off one with the lower margin. The ligament is ochraceous, and by no means prominent. The interior is white, or more rarely tinged with yellow; the primary teeth are almost rudimentary; there is a distinct slightly approximate anterior lateral, and a less developed distant posterior one.

The measured length of a large Scotch example was an inch and an eighth; its breadth, seven-eighths of an inch. The Mediterranean specimens are vastly inferior in size, and are usually tinged with a warmer colouring.

The animal appears to be white; the tubes not produced; the mantle freely open; the foot long, cylindrical, very slender, and not swollen, clavate at the extremity. We have never examined this creature when alive.

This local species, an inhabitant chiefly of our western oceanic shores, inhabits sandy, muddy, or weedy ground, in various depths of water, between eight and one hundred fathoms. It is rare in the south, though occurring off Dartmouth in twenty-seven fathoms, and Plymouth in twenty-eight fathoms (M'Andrew and E. F.); Torquay (Battersby); and Salcombe (Montagu). We are not acquainted with any other English localities for it. On the Scottish coast it is more frequent, and often plentiful, as at Oban, in fifteen fathoms, mud; Lismore, in twenty fathoms; Raza, in thirty fathoms; Mull, in ninety fathoms; the Zetlands, in from eighteen to eighty fathoms; and far from land as well as near the coast; the Moray Firth, in thirty-four fathoms (M'Andrew and E. F.); "Hebrides in many places, and coast of Ross-shire" (Jeffreys). Mr. Macgillivray enumerates it among his shells of Aberdeenshire, but the identity of his specimens is questionable, since he remarks, that it appears to him to be "almost certainly the young of *L. radula*." In Ireland it is abundant in the bays of the Connemara coast, in from eight to eighteen fathoms; Birterbuy Bay and Arran Island (Barlee); Red Bay, county Antrim, and Dublin coast (Thompson); Cork harbour (Humphreys); Bantry Bay (Miss M. Ball); off Cape Clear, in sixty fathoms (M'Andrew).

Abroad it ranges northward to Bergen, in Norway, and southward throughout the Mediterranean.

### L. DIVARICATA, Linnæus.

The striæ diverging from each other at obtuse angles.

Plate XXXV. fig. 3.

*Tellina divaricata*, LINN. Syst. Nat. ed. 12, p. 1120.—(not TURT. Conch. Diction. p. 178.)—SPENGLER, Skrivt. Naturh. Selskab. vol. iv. part 2, p. 117 (not vars).
*Cardium arcuatum*, MONT. (not Reeve), Test. Brit. p. 85, pl. 3, f. 2. — Linn. Trans. vol. viii. p. 67.—WOOD, General Conch. p. 213.
*Lucina arcuata*, FLEM. Brit. Anim. p. 442.
" *commutata*, PHILIPPI, Moll. Sicil. vol. i. p. 32, pl. 3, f. 15, and vol. ii. p. 25.
" *divaricata*, Brit. Marine Conch. p. 76.

This is not the *divaricata* of Chemnitz, Gmelin, and the mass of writers, but, as Dr. Philippi suggests, the original one indicated by Linnæus in his Systema as an inhabitant of the Mediterranean.

The shape is rather obliquely suborbicular, the breadth a little exceeding the length; the valves are ventricose, and occasionally even inflated, opaque (possibly from being only dead specimens), of a dull white, and marked not only with antiquated lines of growth, but with very crowded subimbricated and somewhat radiatingly-divergent striulæ, which form very obtuse angles a little before the middle, whence they bend backwards with a slight retusion, and a trifling declination. In the largest example we have seen the subcentral angles are replaced towards the lower edge by somewhat flexuous striulæ, which are arcuated in a direction contrary to the concentric lines of growth. In this shell, too, although the striulæ extend to the hinder extremity, they are interrupted in front upon the upper dorsal area (which is somewhat flattened), by being broken into several minute and extremely short zigzags, but terminate, however, in their original subretuse downward inclination.

The ventral margin is excessively arcuated, and ascends rather the more behind. The posterior side is the shorter, and appears very high-shouldered, owing to the extremely trifling declination of its but slightly convex dorsal edge; the upper corner is broadly subangulated. The front dorsal edge is likewise but very moderately sloping; it is short, and forms a very wide angle with the rather straightish upper part of the anterior edge. Both extremities are rounded below. The umbones do not greatly project, but the beaks are very acute, lean considerably forward, and are preceded by a small but distinct oblong lunular depression. The ligament is not conspicuous externally, and there is no dorsal depression around its site. The hinge of the right valve is furnished with a single primary tooth, that of the left with two; there are, moreover, two lateral laminæ in both valves. The inner margin, when viewed by the lens, appears most delicately crenulated; the front muscular scar is short and oblong.

Montagu's own specimen (still in our National Museum) is the largest we know of, measuring nearly half an inch in breadth, and rather less in length. The only other

British example we have seen was dredged by Mr. Jeffreys, in twenty fathoms, at St. Mawe's Creek, five miles from Falmouth; the same locality from whence the original specimen was procured. Both shells greatly surpass the ordinary dimensions of the Mediterranean ones.

Poli's figure (Test. Sicil. vol. 1, pl. 15, f. 25) and description of this shell are by no means characteristic, and appear to have been modified from a fancied identity of his species with the larger West Indian *Lucina*, usually known by the name we have applied to the present shell. The valves of *Strigilla divaricata*, stated by Turton (Dithyra Brit. p. 120) to have been picked up on Teignmouth Beach, belong to the Transatlantic mollusk,

(*Tellina divaricata*, Chemn. (not Linn.), Conch. Cab. vol. vi. p. 134, (not var.) pl. 13, f. 129. —Turt. Conch. Diction. p. 178. —Wood, General Conch. p. 195, pl. 46, f. 6.—Dillw. Recent Shells, vol. i. p. 102.—Index Testaceolog. pl. 4, f. 87.

*Lucina divaricata*, Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 226. — Blainv. Man. Malacolog. pl. 72, f. 3. — Gould, Invert. Massach. p. 70.— Dekay, New York Moll. p. 214, pl. 26, f. 273.)

and are correctly described as only "rather convex," with their striæ "not very close," "the margin plain," &c.

### L. flexuosa, Montagu.

Thin, semipellucid, smooth; a radiating sulcus from the beaks to the hinder extremity.

Plate XXXV. fig. 4.

*Venus sinuosa*, Donov. (not Pennant,) Brit. Shells, vol. ii. pl. 42, f. 2.

*Tellina flexuosa*, Mont. Test. Brit. p. 72.—Linn. Trans. vol. viii. p. 56.—Turt. Conch. Diction. p. 177.—Wood, General Conch. p. 188, pl. 47, f. 7, 8. — Dillw. Recent Shells, vol. i. p. 100. — Index Testaceolog. pl. 4, f. 78.

*Amphidesma flexuosa*, Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 128.

*Lucina sinuata*, Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 230.—Hanl. Recent Shells, vol. i. p. 77.

*Cryptodon flexuosum*, TURT. (not of Möller, from type) Dithyra Brit. p. 121, pl. 7, f. 9, 10. — MACGILLIV. Moll. Aberd. p. 278. — BROWN, Illust. Conch. G. B. p. 99, pl. 39, f. 4, 5.

*Lucina flexuosa*, FLEM. Brit. Anim. p. 442.

*Ptychina biplicata*, PHILIPPI, Moll. Sicil. vol. i. p. 15, pl. 2, f. 4, and vol. ii. p. 11.

*Lucina flexuosa*, GOULD, Invert. Massach. p. 71, f. 52.

„ *sinuosa*, Brit. Marine Conch. p. 74.

*Axinus flexuosus*, LOVÉN, Index Moll. Skandin. p. 38.—KING, Ann. Nat. Hist. vol. xviii. p. 242.

This delicate and fragile bivalve is of a distorted suborbicular shape, very inequilateral, and manifestly broader than it is long. It is very thin, more or less ventricose, almost pellucid, slightly glossy, and both externally and internally of a pure or bluish-white; the surface is almost smooth, or is merely concentrically traversed with obsolete subpliciform wrinkles, or lines of growth. The peculiar characteristic features are evidently the somewhat angularly flexuous outline, and the posterior sulcus. This latter, emanating from behind the umbones, and running adjacent (but not parallel with, for it inclines more inwards) to the dorsal edge, is rather broad at its termination where it enlarges, and induces a very distinct incurvation of the posterior outline towards the middle of the hinder side. Above this there is occasionally also a retusion near the end of the dorsal margin, which slopes with but moderate declination, and trifling convexity. The front dorsal edge slopes retusely and very decidedly downward, forming rather more than a right-angle with the greatly rising and little convex anterior part of the ventral margin; which latter, in the adult shell (for immature individuals are far less angular in outline) appears, owing to its abrupt ascent and similar want of convexity behind, to display subcentrally a rounded-off angle; its posterior rise is, however, less marked, and there is no distinct angle at its cessation. The anterior side is very considerably the smaller and the narrower one. The umbones are rather prominent, and incline forwards; the beaks are small and acute; in front of them is a rather large not very profound subovate lunule. The ligament is partially concealed by the overlapping margins. There is a single erect obscure primary tooth in the right valve: the anterior muscular impression is double.

The average breadth of specimens is about three-eighths of an inch, and the length is somewhat less. There is a closely-allied Swedish shell, the *Axinus Sarsii* of Philippi (Lovén, Ind. Moll. Skandinav. p. 38), which differs in being larger, more orbicular, less angular in contour, almost opaque, devoid of the cardinal denticle, having its lunule almost obsolete, and the front angle perfectly so.

The animal, judging from a specimen preserved by Goadby's fluid, is of a white colour, and has a widely-gaping mantle, with two orifices, but no appearance of prolonged tubes posteriorly. The foot is very long, almost filiform, cylindrical, tubular, and presents a clavate extremity.

This beautiful shell is widely distributed around our shores; though, from its delicacy and fragility, and the facility with which the valves separate, perfect specimens are comparatively rare in our cabinets. Mud, or muddy sand is its favourite bottom, and in some places it is found on such ground in considerable numbers. Among its localities may be enumerated,—Weymouth, in seven fathoms, and Dartmouth, in nine fathoms (M'Andrew and E. F.); Exmouth (Clark); Torbay (Alder and S. H.); Falmouth, and other parts of Cornwall (Jeffreys and Alder); Coast of Glamorganshire (Jeffreys); Tenby, where single valves are very abundant (S. H.); Anglesea (M'Andrew); Isle of Man, twelve fathoms, but rare (E. F.); Scarborough (Bean); Coast of Northumberland and Durham (Alder).

Occasionally on the fish-lines, twenty-five miles east of Fern Islands, in thirty fathoms (King, Ann. Nat. H. vol. xviii.). In Scotland it is plentiful in the Clyde (Smith and E. F.), especially around Arran, and many localities of the inner and outer Hebrides (Jeffreys); Skye, in forty fathoms, mud; Zetland, alive, in four, seven, fifteen, seventy and eighty fathoms (M'Andrew and E. F.); and at Deal Voe, in twenty fathoms (Jeffreys); Aberdeenshire (Macgillivray). "It occurs on each side of the Irish Coast; dredged in Strangford Lough on sand and mud, from ten to twenty fathoms, by Mr. Hyndman and myself" (W. Thompson). In various localities on the West Coast of Ireland, as at Clew and Killery, in from three to ten fathoms (Thompson, R. Ball, and E. F.); Dublin Bay (Alder); Bantry (Humphreys); Youghal (R. Ball); Cape Clear, in thirty fathoms (M'Andrew).

Abroad, it ranges northwards to Finmark, and southwards to the Mediterranean. As a fossil it is found in some of the Scottish glacial beds (Smith), and in the crag (S. V. Wood).

### L. LEUCOMA, Turton.*

Opaque, devoid of all sculpture; no external ligament.

Plate XXXV. fig. 2 (as *L. lactea*).

*Tellina lactea* (not of Linn.), PULTENEY, in Hutchins' Hist. of Dorset, p. 30.—MONT. Test. Brit. p. 70.—Linn. Trans. vol. viii. p. 56.—Dorset Catalog. p. 30, pl. 5, f. 9.—TURT. Conch. Diction. p. 176.—WOOD, General Conch. p. 187.—DILLW. Recent Shells, vol. i. p. 99.—Index Testaceolog. pl. 4, f. 76.

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* This not being the *Lucina* which Linnæus intended to indicate under the appellation of *Tellina lactea*, we have reluctantly changed the name to that which Turton bestowed upon a shell so precisely identical (we have compared his own specimens) that we cannot even term it a variety.

*Lucina lactea*, Lam. (not Philippi), Anim. s. Vert. (ed. Desh.) vol. vi. p. 229 (chiefly). — Turt. Dithyra Brit. p. 112, pl. 7, f. 4, 5. — Brit. Marine Conch. p. 71. — Brown, Illust. Conch. G. B. p. 98, pl. 39, f. 3.—Hanl. Recent Shells, vol. i. p. 76.

„ *Amphidesmoides*, Desh. Encyclop. Méthodique, Vers. vol. ii. p. 375.

*Amphidesma Lucinalis*, Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 127 (fide Philippi).

*Lucina leucoma*, Turt. Dithyra Brit. p. 113, pl. 7, f. 8. — Brit. Marine Conch. p. 72.

*Loripes lactea*, Flem. Brit. Anim. p. 430.—Macgill. Moll. Aberd. p. 256 ?— Brown, Illust. Conch. G. B. p. 98, pl. 39, f. 29. — Blainv. Manuel Malacolog. pl. 72, f. 1.

The shape of this shell is very nearly orbicular, and the valves rather strong, opaque, almost entirely devoid of lustre, and of an uniform white both within and without. They are almost equilateral, convex, and usually more or less ventricose at the umbonal region, where the chief swell exists, diminishing gradually and tolerably evenly from thence towards the margins. The surface, which appears peculiarly liable to indentations, is not striated, nor yet quite smooth, but is concentrically traversed by antiquated lines of growth. The upper front corner of the adult is peculiarly compressed, as an extremely indistinct very shallow and rather broad sulcus, emanating from the beaks, runs close to the dorsal edge, and slightly indents the upper part of the front margin at its extremity. The ventral or lower outline is moderately arcuated, and rises rather the more in front, which occasionally (for it varies in extent) gives an air of obliquity to the contour ; it is not flattened on either side, though it is usually rather the more curved behind. The anterior side is rather the shorter, and decidedly the narrower. Both dorsal edges decline in but a very trifling degree ; the hinder, which is rather the higher, is almost straight, or but slightly convex, the front one, which is rather the more sloping, after passing the lunule, becomes a little convex likewise. Both extremities are rounded below, and obscurely subangulated above. The umbones are but moderately prominent, and incline forwards; the beaks are small and inflected; in front of them is a very short, not deeply impressed, lunule. The cartilage, which is large and of a darker colour, occasionally of a reddish-orange, is very obliquely seated in a groove of the hinder hinge margin; which latter is rather broad, and gradually sinks inwards as it nears the posterior extremity. There are no distinct lateral teeth, though sometimes a rudimentary front denticle is found in the right valve, which is furnished with a single primary tooth; in the left valve the cardinal teeth are two in number, but remarkably small in size. The muscular scars are very large; the front one, which is peculiarly narrow and elongated, runs nearly parallel to the front of the palleal impression.

The measured diameter of rather a large example was exactly three-quarters of an inch. There is a dwarf ventricose variety, taken chiefly at Guernsey (S. H.), of only half an inch in length, and rather less in breadth, wherein the hinder dorsal edge does not slope at all, the upper posterior corner is subrectangular, the anterior indentation and shallow groove are almost entirely obsolete, and the surface, when highly magnified, appears radiated with extremely delicate lineoles.

The animal of this species was first examined by Poli, who, recognising its remarkable peculiarities, constituted for it his genus *Loripes*. He described and figured it as having but one fistulose and wrinkled siphon; a cylindrical, subulate, and very long foot, resembling a strap, and club-shaped at the extremity; the mantle, open in front, furnished with two orifices, its margin crenulated; no labial palps; the adductor muscles large and strong; the general colour white, ovaries milky, liver greenish.

Although generally known, this cannot be regarded as one of our common species, perfect pairs, especially with the contained animal, being of comparatively rare occurrence; single valves are often thrown on shore at various spots where there are extensive sands, chiefly on our southern coasts, as at Ryde and Ramsgate (S. H.), and Studland, near Poole (E. F.). It ranges in depth from shallow water to eighty fathoms (M'Andrew). Among its localities may be mentioned Guernsey (S. H.); Littlehampton and Selsea Bill, in Sussex (Strickland); Southampton (Jeffreys); Torbay, Falmouth (Mont. and Jeff. cab.); Scarborough (Bean); Scalloway (Jeffreys); Zetland (M'Andrew); Bantry Bay in fifteen fathoms, and off Baltimore Harbour (M'Andrew).

The name of this species finds its way erroneously into many local catalogues, owing to dead and worn valves of young *Lucina borealis* being mistaken for it. It ranges southward to the Mediterranean, where it is extremely abundant.

### L. FERRUGINOSA, Forbes.

Minute, usually covered with a ferruginous coating, beneath which the surface is smooth; devoid of any fold. Only one denticle in either valve: no oblique cartilage groove on the hinge-margin.

Plate XXXIV., fig. 1 (magnified).

*Kellia ferruginosa*, FORBES, Report of the Brit. Assoc. 1843, p. 192.
*Artemis?* „ JEFFREYS, Ann. Nat. Hist. vol. xix. p. 313.
*Clausina* „ JEFFREYS, Ann. Nat. Hist. vol. xx. p. 18.
„ *abyssicola*, JEFFREYS (not Forbes), Ann. Nat. Hist. vol. xx. p. 18.
„ *Croulinensis*, JEFFREYS, Ann. Nat. Hist. vol. xx. p. 19.

The closely-adherent thick ferruginous coating which envelopes and conceals alike sculpture and outline, by rendering its description and determination a task of more than ordinary difficulty, has led to the separation of this shell into three species, a division which the close examination of a long suite of examples (including the types of the whole) compels us to regard as unnecessary.

The shape is more or less obliquely orbicular subcordiform, and is usually, but not invariably, longer than broad. The valves, which are thin and fragile, vary much in profundity, but are always more or less swollen at the umbones, become, if anything, rather more compressed behind than in front, and diminish rapidly in convexity towards the ventral margin: this latter is greatly arcuated anteriorly and obliquely, and rather suddenly ascends in a straighter line on the posterior side of the shell. The surface, when cleared of the ferruginous earth, which is often disposed in concentric waves, is quite smooth, and, in fine and recent examples, even moderately glossy white and semitransparent, but is more usually met with dull, opaque, and partly eroded. The sides are nearly equal: the front one is obtusely and rather broadly rounded at its extremity; the hinder is bluntly angulated below. The posterior dorsal edge is greatly the more elevated, and runs uninterruptedly with a more or less arcuated sweep to the lower margin; the front dorsal edge is very short and little sloping; it bends inwards under the beaks, which are acute and inclined. The umbones, which lean greatly forward, are prominent, occasionally projecting very considerably. There are no dorsal impressions, but the hinder area is perhaps a little flattened. There is neither fold nor umbonal ridge, and the ligament is not prominent, but is semi-internal, the hinge-margin being slightly excavated for its reception. The interior is glossy, and either white or occasionally stained, somewhat concentrically in aged examples, with purplish liver-colour. The dentition is quite rudimentary: there is only a tubercular denticle in each valve, that of the right being somewhat conical, that of the left being often a callous sublaminar inward projection of the front hinge-margin. There are no lateral laminæ; the ligament has hitherto been taken for them.

There exists a more elongated variety, in which, from the shape, the hinder dorsal edge is almost rectilinear, and rather shorter than usual, and the front one less retuse; the front extremity is more regularly rounded, and the hinder angulation more central.

So small is this curious little shell, that an individual measuring the sixth of an inch in diameter, may be regarded as of large dimensions. It has hitherto been solely procured on our coasts from northern stations, having been dredged in thirty fathoms by Mr. M'Andrew in the Sound of Skye, and by Mr. Jeffreys, at Croulin Island, which lies between Skye and the mainland of Ross-shire, towards Applecross, and in Loch Fyne, in mud, at from twenty to a hundred fathoms (M'Andrew). The species was first obtained by Captain Graves and Lieutenant Spratt from Crete and the Morea, where it inhabits very deep water.

## SPURIOUS.

### L. ORBICULARIS, Montagu.

*Venus orbicularis*, MONT. Test. Brit. Suppl. p. 42, pl. 29. f. 7. — TURT. Conch. Diction. p. 241.
*Cyprina* „ TURT. Dithyra Brit. p. 138.—Brit. Marine Conch. p. 83.
*Cytherea* „ FLEM. Brit. Anim. p. 446.
? *Lucina squamosa*, LAMARCK, Anim. s. Vert. (ed. Desh.) vol. vi. p. 228.

Montagu described this exquisitely sculptured shell from the single valve of an immature specimen; we have most carefully traced out the series, and drawn up the following description from the adult, in which a second lateral lamina is developed, the lunule is no longer minute, and the peculiar projecting angle of the margin above the front lateral tooth becomes occasionally obsolete. The shape is suborbicular, but varies in its proportions of length and breadth; the texture is strong, opaque, and of a pure white externally, but frequently tinged with yellow in the interior, where there is never the slightest appearance (as there ordinarily is in *tigerina*) of crimson stains. The valves, which are not very inequilateral, are rather ventricose, the chief convexity being at the subumbonal region; there is no division of surface caused by any partial flattening of the lateral areas. The entire exterior is covered with very numerous radiating costellæ, which are finest and most closely set in the middle, but become coarser rather less approximate and more divergent at the sides, where they are more manifestly bifurcated. This divergence is most evident near the hinder dorsal surface. Both the costellæ and their interstices are decussated by very delicate concentric slightly raised striulæ, which do not form regular sublunate scales on the former, but simply traverse them in the most crowded manner; there are occasionally, however, some granular projections near the front extremity. The ventral margin is much arcuated, swelling the more in front, and rising the more behind, so as not unfrequently to give an obliquity of outline to the shell. The umbones, which incline very considerably forward, do not project very greatly above the dorsal margin. The declination of the latter is very trifling; the front part, which is short and more or less incurved, terminates at the end of the sunken cordiform lunule, at which point it makes a more or less marked angulation with the upper and straighter part of the anterior side. The hinder dorsal edge, which is much the more elevated and more or less arcuated, is ordinarily, but not invariably, subangulated, yet somewhat indistinctly, at its termination; the upper part of the posterior margin is also generally the straighter. Both extremities are rather broad, and tolerably, but not symmetrically, rounded; that of the hinder side, which is rather the longer, is the more obtusely so. There is no umbonal ridge: the beaks are very acute; the ligament is sunken and partially concealed. The inner margin is all but entire; the hinge-margin of the right valve is furnished, besides having primary teeth, with a strong and not very distant lateral lamina in front, and a smaller less distinct and more remote one behind, both of which fit into corresponding receptacles in the left valve. The front muscular impression is extremely long, and runs almost parallel to the perfectly simple palleal scar. The diameter of rather a large example was seven-eighths of an inch.

*A West Indian shell, introduced by Montagu as found on the shore near Dunbar by Mr. Laskey. The* L. imbricatula *of Adams (Jamaica Shells) is very closely allied, but quite distinct, and differs in having a coarser decussation of sublunate scale-like protuberances upon its ribs, which latter become smaller, and not at all divergent, but bent contrariwise, near the hinder termination.*

### L. TIGERINA, Linnæus.

*Venus tigerina*, LINN. Syst. Nat. ed. 12, p. 1134.—PULTENEY, Hutchins, Hist. Dorset, p. 34.—MONT. Test. Brit. p. 119, pl. 4, f. 1.—Linn. Trans. vol. viii. p. 86, pl. 2, f. 5, (badly). — Dorset Catalog. p. 35, pl. 1, f. 14.—TURT. Conch. Diction. p. 240.—CHEMN. Conch. Cab. vol. vii. pl. 37, f. 390, 391.

*Lucina tigerina*, LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 319, (not vars.)—Brit. Marine Conch. p. 76. — DESH. Elem. Conch. pl. 16, f. 4, 5.—HANL. Recent Shells, p. 78.

*Cytherea tigerina*, TURT. Dithyra Brit. p. 164, pl. 10, f. 12.—FLEM. Brit. Anim. p. 445.

Encyclopédie Méthodique, Vers. pl. 277, f. 4.

*A West Indian shell, introduced by Dr. Pulteney as taken at Weymouth, Studland, and Poole.*

### DIPLODONTA, Bronn.

Shell equivalve, more or less suborbicular, inequilateral, nearly smooth, or marked by lines of growth. Hinge composed of two primary teeth (one of which is bifid) in each valve; no lateral teeth. Ligament external. No lunule. Muscular scars nearly equal, ovate; pallial impression single.

Animal shaped as the shell; mantle open in front, simple at the edges; siphons wanting (?); branchial lamellæ on each side of the body not united into one; labial palps developed, triangular; foot lanceolate.

This genus was established by Bronn for some fossil shells from the tertiaries of Italy, including the *Venus lupinus* of Brocchi. Mr. Gray considers it identical with the genus *Mysia* of Leach's manuscripts, but Bronn, in 1831, was the first to define clearly and restrict the species of this very natural group, and *Mysia* was not published with a definition until 1833. Our British example of it has been bandied from *Tellina* to *Lucina* and back again, finding a brief resting-place in *Psammobia* on the way, without having really very intimate affinity with any of them. With the *Tellinidæ* it certainly has no relations; with *Lucina* we associate it provisionally, for, as will be seen presently, the account of its animal, now first made known by Mr. Clark, presents anomalies not reconcilable with the usual features of the tribe: so peculiar, indeed, that we would earnestly call the attention of malacologists to a minute examination of this curious mollusk. Possibly it should be considered a member of the next tribe.

Several species inhabit the Mediterranean, and some extinct forms are found in the tertiary beds of the same region. Mr. Hanley has a *Diplodonta* from the West Indies, which seems exactly the British species. Philippi describes one from Mazatlan (*D. obliqua*), and Dunker two (*circularis* and *Gruneri*) from Western Africa.

### D. ROTUNDATA, Montagu.

Plate XXXV. fig. 6, and (Animal) Plate M. fig. 7.

*Tellina undata*, Pulteney, in Hutchins' Hist. Dorset, p. 30.
„ *rotundata*, Mont. Test. Brit. p. 71, pl. 2, f. 3. — Linn. Trans. vol. viii. p. 56. — Dorset Catalog. p. 30, pl. 5, f. 8. — Turt. Conch. Diction. p. 176.—Wood, General Conch. p. 187. — Dillw. Recent Shells, vol. i. p. 99.—Index Testaceolog. pl. 4, f. 77.
*Lucina rotundata*, Turt. Dithyra Brit. p. 114, pl. 7, f. 3. —Brit. Marine Conch. p. 73. —Brown, Illust. Conch. G. B. p. 98, pl. 40, f. 11.—Hanl. Recent Shells, vol. i. p. 76.
„ *lactea?* Desh. Encycl. Méthod. Vers, vol. ii. p. 374.
*Psammobia rotundata*, Flem. Brit. Anim. p. 438.
*Diplodonta dilatata*, Philippi, Moll. Sicil. vol. i. p. 31, pl. 4, f. 7.
„ *rotundata*, Philippi, Moll. Sicil. vol. ii. p. 24.
*Loripes* „ Cuv. Règne Animal (ed. Croch.), pl. 103, f. 4.
*Venus fragilis*, (Fossil), Nyst and West, Bull. Brux. vi. p. 401, pl. 3, f. 11.

The shape is suborbicular, with a tendency to squareness, which latter is chiefly effected by the straightness and ordinary absence of declination of the hinder dorsal margin. The valves, which are decidedly inequilateral, moderately capacious, and often ventricose, are rather more swollen behind than in front, the chief swell being, however, subcentral: they are rather glossy, not quite opaque, tolerably firm in texture, and both externally and internally of an uniform white. The surface, from being more or less distinctly marked with lines of growth, is not quite smooth, but is perfectly free from striæ, grooves, or lamellæ, and is not radiatingly subdivided (as in certain analogous shells), by any marked elevation or depression of the lateral areas. The anterior side, which is considerably the smaller, is attenuated both above and below; its dorsal edge, which is nearly rectilinear or subretuse near the beaks, and then very slightly convex, sloping rapidly downwards, and forming an obscure and almost central subangulation with the ascending ventral; this latter is not symmetrically arcuated, but in the adult rises principally and obliquely in front, is not very convex beneath the beaks, and curves out chiefly towards its posterior end. The hinder side is much the broader, its upper corner is more or less distinctly angulated, and its lower rounded off; the posterior margin is usually more or less curved, but varies much in that respect, and the upper or dorsal margin is straight, produced, and not at all sloping. The umbones are moderately swollen, obliquely inclined, and not particularly prominent; the beaks, which are small and inflected, are neither preceded by a lunule, nor any peculiar flatness of the dorsal area. The ligament, which, though rather small and much projecting, is distinct, and occasionally of a golden yellow, is not environed by any excavation. The internal edge of the ventral margin is acute, entire, and not particularly flexuous. There are no lateral teeth, but two rather small primary ones in each valve; of which the bifid is posterior in the right one, and anterior in the left, where the simple tooth is narrow and very oblique. The muscular impressions are large, of rather a produced shape, and nearly equal magnitude; the pallial impression is broad and shining.

The largest example we have ever seen, procured by Mr. Alder from the Cornish fishermen, measures exactly one inch in length, and eleven lines in breadth at the widest part. Such dimensions are nearly unparalleled, the ordidary diameter being only five-eighths of an inch.

We have never seen the animal, but during the course of the summer of 1848 it was met with by Mr. Clark, who communicates the following account of it: — "Animal lentiform, moderately thick; mantle plain, somewhat closed posteriorly and anteriorly, but with a large opening for the foot in the centre of the ventral range ; no siphonal process is to be found ; not even an orifice, except the pedal one, could be detected. The branchial must of course be supplied from the large aperture of the foot. The body is very small, pale-brown ; the liver is suborbicular, granulose, and black-brown ; the rectum runs through the liver. There are two subquadrangular branchiæ, and two palpi, on each side the body ; the former are finely pectinated, and smooth on the under-surface ; the palpi are moderately long, subtriangular, pointed, and striated on one side ; both are of a good brown colour. The foot is clear white, moderately long, flattish, and completely lanceolate laterally, and at the point."

This is by no means a common British shell, and it is confined to the southern shores, ranging up the Irish sea as far as Anglesea. It inhabits sand. As localities, we may enumerate, Poole in Dorset, where it was observed by Montagu; Exmouth (Clark); Fowey, in Cornwall (Alder); Falmouth (Montagu, Cocks). Plymouth, dredged dead in twenty fathoms ; Penzance in twelve fathoms ; Anglesea in the same depth of water, and off Lundy Island in from seven to twenty-five fathoms (McAndrew and E. F). Tenby (Lyons). On the Irish coast it occurs at Youghal (R. Ball), and Bantry Bay (Jeffreys).

It ranges to the Mediterranean. As a fossil it occurs in both red and coralline crags, and was one of the mollusks which retired to southern latitudes during the glacial epoch, and afterwards returned.

## KELLIADÆ.

Although there appears to be a limit to the dimension which each species of Mollusk is capable of attaining in the course of its growth, the several species of a genus do not usually exhibit uniformity of limitation, and not unfrequently we find a very minute and a comparatively gigantic shell in the same group. In the family before us, however, limitation of size to very small dimensions seems to be characteristic of all its members, and thus we are presented with a tribe of minute shells.

Minuteness of size is often accompanied with eccentricity of variation in specific character, consequently in such a tribe as this the relative value of characters is not easy to ascertain, and the distribution of the species into genera a difficult and critical operation ; the more so, as it is no easy task to observe correctly the soft parts of such small mollusks, whilst the difficulty is increased by the scarcity of many of them in the living state. Indeed, until very lately, we had little, if any, account of the animals of the tribe before us, at least in an accessible form,— yet many years ago the inhabitants of four out of the six genera we have adopted in this work had been carefully examined and delineated by our friend Mr. Clark. To him and to Mr. Alder we owe all our knowledge of them, having ourselves examined the animal of *Kellia* only. From their manuscripts and some very recently published notes and figures of M. Deshayes, and M. Mittre, we are enabled to present the details which will be found in the descriptions of the several species.

The family of *Kelliadæ* is an assemblage of minute and mostly fragile bivalves, presenting but few variations of colour and sculpture. They are free, equivalve, often very inequilateral shells, closed or gaping in front. The ligament varies in position, but is commonly cardinal and internal: the dentition is still more variable, cardinal and lateral teeth being present or absent according to the genus or species; sometimes both kinds are entirely wanting. The internal surface always presents an entire pallial impression and roundish muscular scars.

The animals, so far as known, present characters of great singularity. Unless in *Galeomma*, an abnormal form at best, we find them distinguished by the remarkable feature of having only one siphonal opening, and that the anal one, which is sometimes sessile, sometimes produced into a tube, whilst in most, possibly in all instances, the mantle is folded anteriorly into a canal or tube, which appears to be subservient to branchial purposes. The degree of union of the margins of the mantle is very variable. All have a grooved foot, provided with a byssiferous organ, and capable of being used as a creeping disk. The branchial leaflets appear to be always separate, and the labial palps developed.

There would seem to be a considerable affinity between the *Kelliadæ* and the *Arcadæ* and *Mytilidæ*. This we see indicated in the variations of siphonal arrangement and the peculiar foot of the animals, whilst the shell of *Galeomma* reminds us of some Arks, and that of *Montacuta substriata* of *Crenella*. On the other hand, there are distinct relations to the *Lucinidæ* and *Cycladidæ*.

## MONTACUTA. Turton.

Shell small, thin, equivalve, inequilateral, transversely oblong, or obliquely oval, surface smooth, or concentrically striated, or rarely radiatingly furrowed. Beaks inflected. Inner margins smooth. Hinge-margin with a trigonal incision, and cartilage pit, and a pair of diverging laminar teeth in one or both valves. Ligament internal. Muscular scars suborbicular, pallial impression simple.

Animal oblong, its mantle freely open in front, with simple margins, not furnished with siphonal tubes posteriorly; a single siphonal orifice (anal) or none (?). Foot very large, strong, and broad, furnished with a byssal groove.

The composition of this genus is still unsatisfactory, and it is very possible that when the animals of the several species shall be better known, a division of the group will become necessary. *Montacuta substriata* is possibly the type of a distinct genus, but in the present state of our knowledge we prefer keeping the species known as *Montacutæ* together, with the exception of *M. purpurea*. Recluz has united them with the *Kelliæ*, to which, indeed, they are very nearly allied. They are all minute and inconspicuous bivalves, possessed of considerable powers of locomotion, yet also in the habit of mooring themselves firmly by means of a byssus. Their generic appellation was given in honour of Montagu, a name deeply reverenced by every British malacologist and deserving of some more conspicuous testimonial.

The genus dates its genealogy from the epoch of the coralline crag in which our *M. substriata* and another species have been found fossil.

### M. FERRUGINOSA, Montagu.

Elongated, smooth, moderately inequilateral.

Plate XVIII. figs. 5, 5 a, and 5 b, (as *ferruginea*).

*Mya ferruginosa*, MONT. Test. Brit. Suppl. pp. 22, 166, pl. 26, f. 2. — Dorset Catalog. p. 28. — TURT. Conch. Diction. p. 102. — WOOD, General Conch. p. 100.—DILLW. Recent Shells, vol. i. p. 46. —Index Testaceol. pl. 2, Mya, f. 19.

*Montacuta ferruginosa*, TURT. Dithyra Brit. p. 60.—FLEM. Brit. Anim. p. 465. —Brit. Marine Conch. p. 52, f. 16.— HANL. Recent Shells, p. 40.

*Tellimya elliptica*, BROWN, Ill. Conch. G. B. p. 106, pl. 42, f. 19.

*Erycina ferruginosa*, RECLUZ, Revue Zool. Cuv. 1844, p. 332.

*Montacuta oblonga* (Young), TURT. Dithyra Brit. p. 61, pl. 11, f. 11, 12. — FLEM. Brit. Anim. p. 465.—Brit. Mar. Conch. p. 52.— MACGILLIVRAY, Moll. Aberd. p. 302.

*Tellimya glabra* (Var.), BROWN, Ill. Conch. G. B. p. 107, pl. 42, f. 20, 21.

*Montacuta glabra*, MACGILLIV. Moll. Aberd. p. 303. — Brit. Marine Conch. p. 245.

Although to be ranked among our smaller shells, the *M. ferruginosa* is by far the largest of the published species of this genus, which at the present time is very limited in the number of recorded members. The shape, which is not a little variable, ranges from simply oval to oblong-elliptical, the breadth being occasionally less than, but more frequently exceeding, half the length. It is decidedly inequilateral, although not pre-eminently so for the genus, the hinder side being usually about half as large again as the anterior one. Its valves are slightly ventricose, glossy, and either substriated concentrically, or almost smooth; they are the former when taken (which is rarely the case) in perfect condition, and containing their animal inhabitant, but the majority of cabinet specimens consist of single valves, which from previous attrition have become glabrous. The texture is thin, dull, fragile, but scarcely subdiaphanous, and of a pure white, but the surface is often concealed by a thick coating of rust-coloured earth, from which circumstance the shell has derived its specific epithet. The ventral edge is but slightly convex, but curves upward at both extremities. The hinder side is produced ; its termination is usually well rounded, and a little tapering, but occasionally is subangulated above ; its dorsal edge (except in the elongated typical variety, where all the edges are comparatively rectilinear) is more or less convex, or even arched towards its termination, but straightish or even subretuse near the umbones ; its declination is extremely trifling. The shorter anterior side exhibits a considerable difference in its aspect, being occasionally much abbreviated and rounded, and rather broad at its extremity, at other times slightly more elongated, and from the greater declination of the dorsal edge is narrowed and subangulated at its lower extremity. The beaks are small, acute, and directly inflected, not leaning to either side ; they are distinct, but by no means prominent. The inside is white, the margin plain and acute, with often a slight vestige of a subcentral retusion. The hinge-margin, which is interrupted by a trigonal incision beneath the beaks, is furnished with an erect narrow simple and almost vertical tooth behind the notch, and a more oblique and rather less immediately approximate acute conical denticle before it, which latter projects downward and inwards, and forms apparently the terminal wall to an appressed and anterior cartilage-pit.

In the right valve, where the apical perforation for the ligament is most evident, the posterior tooth is less developed, hardly amounting in some individuals to more than an elevation of the cardinal edge.

There are two most distinct forms of this shell ; the rarer (which is that figured by Montagu, who, however, possessed both varieties, and regarded them as specifically identical) is elongated, with its margins straightish, its hinder extremity a little subangulated above, and its front one subangulated below. The other variety is less produced, its margins more arcuated, and rounded at both extremities. Intermediate specimens possessing the angulation of the former variety, with the abbreviated shape and arcuated basal margin of the latter, or the general features of the latter variety with the elongated shape and anterior subangulation of the former one, unite inseparably these two forms.

The largest example we have seen measures three-eighths of an inch in length; the majority of specimens do not exceed five-sixteenths of an inch from side to side.

"The animal of this species," Mr. Alder writes to inform us, "agrees with the other *Montacutæ*, in having the foot exserted at the larger end of the shell, and presenting no apparent tubes. There appears to be only one posterior aperture."

This is a scarce shell, though widely distributed. The larger variety is in most instances sublittoral in its habits, the other ranging to deep water; South Devon (Jeffreys); Dartmouth in seven fathoms (M'Andrew and E. F.); Tenby (S. H.); Scarborough (Bean); Cullercoats (Alder); Lamlash Bay in Arran (Alder); Inverary (Barlee); Hebrides, Zetland, and Murray Firth (M'Andrew); St. Andrews (Knapp); Frith of Forth (E. F.); Belton Sands near Dunbar (Laskey). Cork Harbour (Humphreys); Youghal (Jeffreys); Birterbuy (Barlee); "Dublin coast, whence only I have yet seen specimens" (W. Thompson). Cape Clear in thirty fathoms (M'Andrew).

No foreign author notices this species as an inhabitant of other seas than ours.

### M. BIDENTATA, Montagu.

Abbreviated, devoid of radiating elevated lines; front side excessively short, bluntly biangulated.

Plate XVIII. figs. 6 and 6 A.

*Mya bidentata*, MONT. Test. Brit. p. 44.—Linn. Trans. vol. viii. p. 41.—TURT. Conch. Diction. p. 102.—WOOD, General Conch. p. 99.—DILLW. Recent Shells, p. 45.

*Montacuta bidentata*, TURT. Dithyra Brit. p. 60.—FLEM. Brit. Anim. p. 465.—MACGILLIV. Moll. Aberd. p. 302. — Brit. Marine Conch. p. 52. f. 58 (badly). — ALDER, Cat. Northumb. and Durham Moll. p. 95.

*Petricola* „ GRAY, Annals of Philos. 1825. — HANL. Recent Shells, p. 54.

*Erycina* „ RECLUZ, Rev. Zool. 1844, p. 331.

*Tellimya* „ BROWN, Ill. Conch. G. B. p. 107, pl. 44, f. 8, 9.

In outline this species approaches the subrhombic oval, the dorsal margin running in some degree parallel with the ventral. The valves are excessively inequilateral, their convexity is but moderate, their substance very thin and fragile, but not at all translucent, and their surface nearly smooth, or at most but striolated, and equally devoid of lustre as of colour. The ventral margin varies from simply convex to subarcuated; and the hinder dorsal edge, which is elongated, and at first straight or scarcely convex and hardly declining, forms by its junction with it a well-rounded and rather broad posterior extremity. The front side, which is infinitely the smaller, varies, however, in its proportion to the hinder, being at times only one-fifth as large as the latter, whilst, in certain specimens, it occupies more than one-fourth the entire length of the shell. The front dorsal edge is rather retuse than otherwise, and by its very abrupt descent narrows the anterior extremity, which by the ordinary absence of arcuation in the front margin appears very bluntly biangulated. The beaks are acute, inflected, oblique, and one of them tolerably prominent. The interior is white and glossy, and the margin simple. The hinge consists, in the left valve, of an apical laminar tooth on each side of the beak, each diverging widely from the other, and separated by a wide triangular cavity. The hinder tooth is by far the larger, and both are absent in the edentulous right valve, which, however, presents much resemblance to the other, from the margins themselves on either side of the still broader triangular cavity being elevated so as to resemble laminæ, but not like the teeth of the other valve, distinctly divided from the rest of the dorsal margin, by an intervening sulcus. Professor Lovén has detected a rudimentary ossicle, which appears to Mr. Alder, who has likewise observed it in British examples, a mere calcification of the lower part of the ligament. It is so easily detached that very few cabinet specimens ever exhibit it. The length of the shell is half as large again as the breadth, and at the very most is but a quarter of an inch, but rarely, indeed, attains to much more than half that measurement.

A sketch, communicated by Mr. Alder, represents the animal extending its large and broad foot from the longer extremity, but presenting no traces of siphonal tubes. This is a well-diffused species, but never a very common one, indeed, pairs are very scarce, and even single valves, except locally, are not plentiful. It is generally found burrowing in very thick valves of dead oysters. It is taken at Cullercoats, near Newcastle (Alder); Scarborough (Bean); Weymouth (Jeffreys); Salcomb Bay (Mont.); Liverpool (M'Andrew). In Wales, at Tenby (Lyons and S. H.); Oxwich Bay, near Swansea (Jeffreys). Belfast Bay extremely rare, and Dublin Bay (W. Thompson); Portmarnock, Bantry Bay, and Cork Harbour (Humphreys), are among its Irish localities. In Scotland, in many of the lochs and other localities among the Hebrides (Jeffreys and Barlee); Lamlash Bay, in Arran (Alder).

The *bidentata* of Gould, does not exactly coincide (in description, at least,) with our British species.

### M. SUBSTRIATA, Montagu.

Very oblique; with divergent elevated lines upon the umbones.

Plate XVIII. figs. 8 and 8 A, and (Animal) Plate O. fig. 2.

*Mya substriata*, MONT. Test. Brit. Suppl. p. 25.—TURT. Conch. Diction. p. 103. — WOOD, General Conch. p. 102. — DILLW. Recent Shells, vol. i. p. 47.

*Montacuta substriata*, TURT. Dithyra Brit. p. 59, pl. 11, f. 9, 10. — FLEM. Brit. Anim. p. 465. — MACG. Moll. Aberd. p. 303. — Brit. Marine Conch. p. 51. — ALDER, Cat. Northumb. and Durham Moll. p. 96.

*Erycina substriata*, RECLUZ. Rev. Zool. 1844, p. 330.

*Tellimya substriata*, BROWN, Ill. Conch. G. B. p. 107, pl. 40, f. 23.

? *Sphænia costulata*, MACGILLIV. Moll. Aberd. p. 301. — Brit. Marine Conch. p. 245 (copied). — BROWN, Ill. Conch. G. B. p. 133 (copied).

This little bivalve, which derives additional interest from its peculiar habitat, is remarkably oblique in outline, very thin, fragile, semi-transparent, extremely inequilateral, and of a more or less oval shape. The valves are not ventricose, but are moderately convex, the swell being generally diffused over the upper portion, and diminishing gradually and equally towards either extremity; when fresh, they are covered with a glossy yellowish (or colourless) skin, beneath which the surface is pale or whitish. The exterior is marked with radiating subdivergent elevated lines, which are rather distant, not readily perceptible, and most apparent upon the middle area: there is no other sculpture whatsoever. The anterior side, which is greatly the longer, is ample, and is rounded almost symmetrically both above and below, its dorsal margin being arcuated, except near the beaks, and ordinarily but little declining. The ventral edge is slightly contracted near the middle, but swells out in front, and ascends with rather a straightish inclination on the posterior side. This latter, which is excessively short, is narrowed not only by the rise of the ventral margin, but also by the decided slope of the hinder dorsal edge, which latter rarely displays much, if any, convexity, so that although the posterior tip is curved, the hinder extremity is not distinctly and symmetrically rounded. The umbones are very prominent; the beaks acute and inflected. There is neither an umbonal ridge, nor any dorsal depressions. The front laminar tooth is large and distinct in each valve, in the right it is triangular: the hinder one is very obscure, and only rudimentary, being rather the denticular termination of the supporting plate of the large cartilage, than a veritable tooth. This shell is very diminutive, being but an eighth of an inch in length, and only a tenth of an inch in breadth.

"Animal sub-oval, thick for its size, with an oblique outline, the longitudinal measure being greater than the transverse. Body and mantle of the palest yellow, liver dark-green. Foot hyaline. The mantle has the margin simple, and is largely open ventrally, for the passage of the foot, which has a byssal groove at its heel, from which strong filaments issue, and attach it to its usual habitat, the spines of *Spatangus purpureus;* all the eleven observed specimens were thus attached, and could not well be removed by force without injuring the animal or shell. They were cut off by scissors, and, on being placed in a watch-glass of sea-water, immediately put forth their large foot, far exceeding any measure of the shell in length, and which is muscular, strong, flat, raised in the centre throughout its length, being bevelled to a fine awl-like edge, but its base is very broad, and it tapers to a very rounded termination, not shewing a trace of a lanceolate point. Its locomotive powers would appear to be incompatible with its apparently fixed habitat, if we did not infer that it can detach itself to change place—a power we have observed in other byssal bivalves. When the animal marches the foot is greatly extended, and in this case the rounded termination was instantly fixed to the side of the watch-glass filled with sea-water, in which it was placed. By the muscle of the foot it drew itself forwards, '*iterumque, iterumque*,' and this manœuvre was executed with such rapidity that the watch-glass was crossed in a minute. In its passage, the creature, by a twist of its foot, several times turned the shell from one side to the other. Not a trace of siphonal processes, or even a simple orifice could be observed in the mantle at either end. When opened for examination the large foot was the most prominent object, and, with a powerful lens, the byssal groove was distinctly visible. Though a pectinated lamina was seen, it was impossible, with the appliances used, to develop the form, or detect the presence of palpi in an animal not one-eighth of an inch in diameter."—CLARK, MSS.

"Mr. Howse's observations on the animal of this species agree with ours on *M. bidentata*, as to the shape and position of the foot, and apparent absence of siphons."—ALDER.

Whenever we have met with this curious and scarce shell alive, it has been attached by its byssus to *Spatangus purpureus*. Though rare, it has a wide distribution. Among corallines in deep water on the Devonshire coast

(Montagu); Exmouth (Clark); Penzance in twenty fathoms (M'Andrew and E. F.); Scarborough (Bean). " Taken abundantly by Mr. R. Howse on the spines of *Spatangus purpureus* from sixty fathoms water, fifty miles off the coast of Durham." (Alder.) To the west of Manorbeer, in Pembrokeshire (Lyons); Tenby (Jeffreys); Isle of Man in twenty-five fathoms (E. F.); from fifty to one hundred and forty fathoms off the Mull of Galloway (Beechey); Loch Alsh (Barlee); Copenhaw-head, off Skye, in forty fathoms; Balta Sound or Unst, in from five to ten fathoms and in ninety fathoms, thirty miles from land off Zetland (M'Andrew); Lerwick (Jeffreys); Aberdeenshire (Macgillivray). Entrance of Belfast Bay, in twenty-five fathoms (Thompson); Arran, west of Ireland (Barlee); Bantry Bay (Jeffreys). Lovén records this shell as ranging to Finmark on the Scandinavian seas; it is not known south of Britain.

### TURTONIA. Hanley.

Shell minute, fragile, equivalve, very inequilateral, closed at both ends, transversely oblong; surface concentrically striated or nearly smooth. Ligament external; hinge with two adjacent teeth in front, the anterior one laminar. Pallial sinus simple.

Animal with the mantle widely open anteriorly, a single very slender siphonal tube at the shorter end, and an ample and strong foot angulated at its posterior base proceeding from the longer.

The features of the curious and very minute bivalve for which this genus has been founded are so peculiar, that its claim to become the type of a separate group cannot be called in question. Resembling a *Montacuta* in external aspect, the shell is removed at once from that genus by the structure of its ligament, whilst the produced anal siphon equally distinguishes the animal. Professor Lovèn, in his "Index Molluscorum Scandinaviæ," has placed the *Turtonia minuta*, with a query, in *Cyamium* of Philippi, a genus founded for a curious antarctic shell, but where it cannot remain, since the latter has an internal ligament.

The genus is dedicated to Dr. Turton, a clever but eccentric conchologist, who, by his energy and scholarship, gave a great impulse to the study of our native shells. His collections are fortunately mainly preserved in the magnificent cabinet of our valued friend and correspondent, Mr. Gwyn Jeffreys. A close examination of them has shewn that Turton was not always to be relied upon in his published statements, and that a severe and critical judgment must be applied to his labours in conchology.

### T. MINUTA, O. Fabricius.

Plate XVIII. fig. 7 and 7 A, and (Animal) plate O. fig. 1.

*Venus minuta*, O. FABR. Fauna Grænl. p. 412.
*Mya purpurea*, MONT. Test. Brit. Suppl. p. 21.—TURT. Conch. Diction. p. 102. —WOOD, General Conch. p. 100. — DILLW. Recent Shells, vol. i. p. 46.
*Montacuta ? purpurea*, HANL. in Brit. Marine Conch. p. 25, f. 14.
*Erycina purpurea*, RECLUZ. Rev. Zool. 1844, p. 329.
*Lesæa minuta*, MÖLLER, Ind. Moll. Grænl. p. 20.
*Saxicava purpurea*, BROWN, Ill. Conch. G. B. p. 103 (not figures).
*Cyamium ? minutum*, LOVÈN, Ind. Moll. Scandinaviæ, p. 42.
*Turtonia minuta*, ALDER, Cat. Northumb. and Durham Moll. p. 95.

This minute shell, which, although known to Montagu, escaped the observation of Turton, is of an oval and very slightly sub-cordate shape, thin, semitransparent, very inequilateral, slightly glossy, almost smooth, and of a purplish brown tint, which becomes deeper coloured posteriorly, the front being so pale as, in some specimens, almost to be devoid of colouring matter; the beaks are dark purple. The valves are moderately convex, and rounded at both ends, the termination of the posterior side,—which is much produced,—more obtusely and broadly so; the extremity of the anterior side,—which is both narrow and small, at most occupying one-fourth of the length of the shell, and a very much smaller proportion of its area,—simply and regularly so. The ventral margin is subarcuated, and both dorsal lines are decidedly convex, the front one declines strongly, the hinder one scarcely slopes at all. The umbones appear oblique, and when viewed in front are decidedly prominent, they being raised on that side considerably above the dorsal line. The beaks themselves are blunt, and there is no defined lunule in front of them. The internal colouring resembles the external, the margin is plain, and the pallial impression, as far as can be ascertained, is simple and not sinuated. The cardinal edge is very narrow, only jutting out just at the shorter side, to which portion of it the dentition is confined. The extreme minuteness of the teeth almost baffles one's eyesight, even when aided by the most powerful lens, and from the lesser size of our British examples, the dentition does not appear so clearly developed as in the northern exotic ones.*

We are unable to perceive any lateral teeth, although there is a very slight elevation of the hinge-margin at the extremity of the ligament in each valve, which may possibly be regarded as such by some individuals. There appear to be two primary teeth in each valve, but so closely adjacent, as almost to resemble a single complicated one. In the right valve, the lunular or foremost one is strong and subtriangular, the other, which lies under the middle of the umbo, is somewhat smaller; in the left valve the central tooth is the larger, and is conic and erect, the lunular one being the less conspicuous, inclining forwards, and, as well as in the right valve, somewhat laminar. The ligament is not really internal, yet is not visible until the valves are opened, lying as it does between the hinder dorsal edges without projecting externally. The length of this minute shell rarely exceeds the twelfth of an inch, and its breadth is but a trifle more than half that measurement.

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* Lovèn's description of the hinge stands thus:—"Cardo valvæ dextræ fossâ lunulari parum profundâ, dente lunulari subtrigono, valido, fossâ cardinali angustâ, profundâ, subtrigonâ, dente cardinali ferè sub medio umbone sito, lunulari paullum minore, rotundato; valvæ sinistræ dente lunulari minuto, antrorsum obliquo, fossâ lunulari magnâ, trigonâ, dente cardinali valido, fossâ cardinali magnâ, satis profundâ; dentes laterales parum prominuli, longitudinales: impressio muscularis antica duplex, superior minuta, inferior ovalis, verticalis, posterior ovalis, superne emarginata; impressio palliaris vix discernenda integra videtur."—*Index Moll. Scand.* p. 43.

All we know of the animal is contained in the generic character, due to the observations of Mr. Alder. It inhabits pools and crevices of rocks between tide-marks, usually high up, often in company with *Kellia rubra.* Adhering to corallinæ from the rocks of the little islet of Herm near Guernsey (S. H.); at Scarborough it is common in the roots of the *Chondrus crispus* (Bean); it is likewise captured in Northumberland (Alder); Whitesand Bay in South Devon (Jeff. cab.); Exmouth (Clark); Falmouth (Jeffreys); abundant among the roots of *Corallina officinalis* and *Lichina*, near high water-mark on slate rocks in the Isle of Man (E. F.). At the roots of *Lichina pygmæa*, Oxwich and Langland Bays in Glamorganshire (Jeff.); Tenby (Lyons).

In Ireland it is found in Cork harbour (Humphreys); Portmarnock, Belfast (Jeff. cab.); and is indeed "abundant on the north-east coast, in the stomachs of Mullets"

(Thompson, Ann. Nat. H. vol. v. p. 14). Coast of Wexford and Waterford (E. F.); Dublin Bay (Alder); Birterbuy Bay and Arran Isles on west coast (Barlee.)

In Scotland it is taken on Tarbert Island (Jeffreys); Oban (Barlee); Orkneys (Thomas).

The *Turtonia minuta* was first observed by that most acute naturalist, Otho Fabricius, who found it in Greenland. It is enumerated among Scandinavian shells by Lovèn, and Recluz states that it is very common on the west coast of France near Cherbourg.

### KELLIA. Turton.

Shell thin, equivalve, subequilateral, suborbicular, tumid or compressed, closed, smooth, or concentrically striated. Beaks incurved, small; inner margin smooth. Hinge composed of one or two primary teeth in either, and a lateral one in both valves. Ligament internal or submarginal; in some species (Poronia) placed on a cartilage bed, formed of the thickened hinge margins of each valve, in others (Kellia), interrupting the hinge margin. Muscular scars suborbicular, pallial sinus entire.

Animal suborbicular, its mantle much closed, furnished posteriorly with a single, very short, siphonal (anal) tube, and anteriorly prolonged into a canal or hyaline tube, of considerable dimensions, the margins of which are either united, so that a separate orifice is formed, or open, so as to be continuous with the pedal slit. Foot ligulate, furnished with a byssal groove. Branchial leaflets free; lateral palps triangular.

This genus was formed by Turton, for the reception of the *Cardium rubrum* and *Mya suborbicularis* of Montagu. Subsequent researches have shewn, that the group so proposed is a natural one, and Philippi, unacquainted with Turton's genus, framed his BORNIA for the same assemblage of species. When two naturalists, working apart, constitute generic groups of equal limitation, there is a strong presumption in favour of the naturalness of the sections proposed.

Recently, however, M. Recluz has proposed the generic separation of the two shells mentioned, and regards them as the types of different genera. Convinced that the *Poron* of Adanson, somewhat indistinctly described and figured by that celebrated naturalist, is a near ally of the *Kellia rubra* (a conclusion to which he has been led by an examination of the Senegal shells in the collection of M. Petit); he constitutes a genus PORONIA for these shells, founding it chiefly in minute peculiarities of the hinge.* These differences seem, he remarks, in a tone of censure, to have escaped Fleming and Macgillivray, who have not, however, in their descriptions, committed the very unscientific mistake of uniting an animal with two separated siphons to a shell presenting an entire pallial impression. We are inclined ourselves to regard such minute variations of hinge and ligament, as of little value in this family—a view we take, in common with two most sound authorities, Lovèn and Alder. The latter malacologist, has, however, discovered a feature in the animal of *Kellia rubra*, so peculiar, when compared with that presented by *Kellia suborbicularis*, viz., the open anterior tube of the former, as contrasted with the closed one in the latter, that we were almost inclined to adopt *Poronia* in a new sense. But in one of the lately-published numbers of the "Mollusques d'Algerie" there is a beautiful figure of the animal of *Erycina Geoffroyi*, an undoubted *Kellia* as to its shell, presenting the very conformation observed by Mr. Alder in the *rubra*, whilst on the other hand, a figure of the *Bornia seminulum* of Philippi, identical specifically with the *rubra*, represents the anterior process as a true tube; in this respect agreeing with a drawing and description of the animal of *rubra*, communicated to us by Mr. Clark. These facts induce us to conclude, that the peculiar conformation of the hyaline anterior process, whether tube or canal, is probably an individual, and possibly a sexual difference. At any rate, in the present state of the case, it cannot be received as generic. We need scarcely say, that the animal of the *Poron*, as quoted by Recluz from Adanson, does not in the least agree with that of any of our *Kelliæ*. *Chironia* of Deshayes and *Cycladina* of Cantraine appear to be synonymous groups.

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* The generic character given by M. Recluz, runs as follows:—"Testa ovata seu subrotunda, regularis, transversalis, æquivalvis, inæquilatera, clausa. Apices minuti, anticè recurvati. Lunula areaque nullæ. Cardo dentibus cardinalibus duobus in utraque valvula, apicali minima ante auctam (?), antica majori apicalem approximata, transversali, concava, ad marginem superam inflexa et in valvula dextra inserta; fossula interposita, elongata, oblique valde transversali, sub dente laterali decurrente, ligamentum magnum, cartilagineum, unicum ferente; dente laterali unica, postica, remota, in valvula sinistra triangularia, in dextra inserta. Impressiones musculares ovales, æquales. Sinus palliaris nullus.

"Animal fere ignotum, pallio postice bilobo; siphonibus duobus, disjunctis; pede plano, acuto."—Recluz, Revue Zoologique, June, 1843.

The *Kelliæ* are small, but elegant, bivalves, living usually in crevices of rocks, or shells, or sea-weeds, spinning a byssus, or lying free. They bear a striking external resemblance to the fresh water *Cyclades*. Some live along the coast line, others in the depths of the ocean. They have been included in the heterogeneous genus *Erycina*, founded by Lamarck, for a strange *melange* of *Tellinæ*, *Diplodontæ*, *Astartes* and *Kelliæ*, but proposed recently by M. Recluz to be restricted to an assemblage including *Kelliæ* proper and *Montacutæ*. The name, however, with all the confusion which attends it, had far better be dropped altogether. That of *Kellia* was given by Turton, in honor of his friend and instructor, Mr. O'Kelly of Dublin, a gentleman who, we are happy to say, is still among us, enjoying the pleasures of natural-history research in his native land. There are about a dozen species of *Kellia* known (including *Poroniæ*), scattered through the seas of all parts of the globe. *Kelliæ* occur also as tertiary fossils, and have been enumerated, but without sufficient grounds, among the carboniferous limestone shells of Ireland.

### K. SUBORBICULARIS, Montagu.

Pure white, more or less ventricose, two primary teeth in one of the valves.

Plate XVIII. figs. 9, and 9 a, 9 b., and (animal) Plate O. fig. 4.

*Mya suborbicularis*, MONT. Test. Brit. p. 39, and 564. — Linn. Trans. vol. viii. p. 41.—DILLW. Recent Shells, vol. i. p. 55.
*Tellina suborbicularis*, TURT. Conch. Diction. p. 179.
*Kellia suborbicularis*, TURT. Dithyra Brit. p. 56, pl. 11, f. 5, 6. — FLEM. Brit. Anim. p. 430.—MACGILL. Moll. Aberd. p. 276.—Brit. Marine Conch. p. 51.—ALDER, Cat. Northumb. and Durham Moll. p. 93.—Index Testaceolog. pl. 3, f. 37.—HANL. Recent Shells, vol. i. p. 43, pl. 3, f. 37.
*Bornia inflata*, PHILIPPI, Moll. Sicil. vol. i. p. 14, and vol. ii. p. 11.
*Tellimya suborbicularis*, BROWN, Illust. Conch. G. B. p. 106, pl. 42, f. 14, 15.

An examination of a large number of specimens, so closely united by exact links, that their specific identity is irrefragable, demonstrates, that without the distortion, by which in other *lithodomous* genera (*Petricola*, *Venerupis*, *Saxicava*, *&c.*), the shape is so strangely transmuted, the outline of this *Kellia* may vary from subrhombic, with the distance from the anterior to the posterior extremity greatly exceeding that from the beaks to the opposite margin, to triangularly orbicular, with the breadth surpassing the length, which latter outline is necessarily accompanied by a greater declination of the dorsal edges.

The ordinary shape, then, is subrhombic, with the angles softened down; the shell is ventricose or inflated (if much produced, it is comparatively compressed), very thin and fragile, moderately inequilateral, and of a transparent white, under a very delicate glossy yellowish epidermis, which, in certain specimens, faintly reflects prismatic colours. The surface is almost smooth, and not distinguished by any other sculpture than more or less developed concentric striulæ; it is, moreover, not polished, but faintly shining. The ventral and hinder dorsal edges are more or less subparallel, although inclining a little towards each other; the former is convex at the extremities (where it ascends nearly equally on either side), but a little straightened in the middle; the latter barely convex and (except in the abbreviated variety) scarcely sloping. The hinder side, which occupies about two-thirds of the shell, is broad and very bluntly subbiangulated at its extremity, the posterior edge not being arcuated, but, at most, convex. The front extremity, which is rather the narrower one, is almost symmetrically rounded in the more produced forms, and bluntly rounded in those which are less elongated; the lower corner is invariably rounded, the upper less habitually so; the front dorsal edge is straightish near the umbones, then more or less convex, and, except in the abbreviated form, declines but very moderately. The umbones are rather prominent and incline slightly forward; the beaks are small, very acute and hardly lean to either side. There is no lunule, nor any inflection of the dorsal surface. The interior is white, with a large elongated somewhat triangular rather oblique brownish-yellow ligament, situated close under the beaks on the posterior side, (interrupting the hinge margin, and causing, when removed, an apparent cavity in it); behind it, in either valve, stands a subtrigonal, and rather remote, lateral lamina. In the right valve, the short but rather broad anterior hinge-margin, which is subvertically truncated just beneath the beaks, is furnished with a single erect somewhat recurved primary tooth, immediately under the apex of the shell: this tooth leans a little forward, and, as well as its opposing ones, is not bifid. In the left valve are two adjacent primary teeth; the more central, having either a perpendicular or posterior inclination, is separated by a slight triangular incision of the hinge-margin from the anterior one, which latter (usually the less elevated, often appearing a simple upcurving of the notched hinge-margin) leans slightly forward.*

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* From the small size and extreme fragility of the teeth, and the liability of portions of the cartilage to be mistaken for them, it is not impossible that the *Tellimya lactea* and *tenuis* of Brown, are only individuals of this variable species. At least such appears to be the general opinion of conchologists, none of whom have been fortunate enough to procure examples agreeing with the descriptions, which, upon close scrutiny, have not proved to be individuals of the *K. suborbicularis.*

*Tellimya lactea*, Brown, Ill. Conch. G. B. p. 106, pl. 42, f. 10, 11.

"Nearly orbicular, inflated, thin, pellucid, and glossy white; one valve with two teeth locking into a triangular void in the opposite valve, with transverse laminæ on each side; left valve with a single recurved cardinal tooth, and a central triangular laminated tooth, and one remote lateral tooth only. About a quarter of an inch in diameter. Found on the Devonshire coast by Dr. Leach."

Captain Brown, who still retains his original impression of its distinctness, informs us that his drawing was taken in 1819, at the British Museum, from a specimen in Dr. Leach's collection.

*Tellimya tenuis*, Brown, Ill. Conch. G. B. p. 106, pl. 42, f. 12, 13.

"Orbicular, smooth, glossy, snow-white, with fine irregular concentric striæ, much inflated; umbones rather produced, and much turned to one side; left valve destitute of cardinal teeth, and provided with two large lateral teeth; right valve with two incurved cardinal teeth and a lateral one; inside white, and when viewed through a strong lens, has a shagreen-like appearance. Diameter three-eighths of an inch. Found at Newbigging, Northumberland, by W. C. Trevelyan, Esq., and is in his cabinet at Wallington."

The hinge sometimes appears different, from there being a very minute almost linear denticle, immediately above the single tooth of the right valve, which, in some specimens, becomes more developed, inducing the idea of there being two primary teeth in each valve; and all these teeth frequently curve towards the beaks. The internal surface, when slightly magnified, appears a little punctulate, but does not exhibit any pallial sinus.

Specimens are usually about five-twelfths of an inch long, and very nearly a third of an inch broad, but the proportions are very variable; we have seen none exceeding half an inch in length.

The fullest published account of the animal of this pretty and *Cyclas*-like shell is contained in Mr. Alder's valuable catalogue of the Mollusca of Northumberland and Durham. From this description, extensive manuscript notes communicated by Mr. Clark, and our own observations, we have drawn up the following summary of its features. It is white and translucent; the mantle is closed, except at three places, viz., in front or ventrally, where there is an orifice for the passage of a narrow, long, slender, ligulate foot; anteriorly, where it is produced into a hyaline tube, undivided within, very broad, and capable of extension to a length equalling the breadth of the shell; posteriorly, where there is a single, very short tube or siphon, seldom protruded beyond the shell. The margins of all these orifices are plain, but there is a fringe of very minute, short, distant, tentacular processes on the mantle, just within the edge of the shell. The foot is furnished with a byssal groove. The branchial leaflets are symmetrical and subtriangular, the labial palps short, subtriangular, and unequal. When the animal is confined, as it often is, in the crevice of a rock or the cavity of a shell, its locomotion is almost limited to a half-circular turn on one of its sides; but when free, it is capable of considerable change of place, aided by its strap-shaped foot, crawling forwards, backwards, or sideways, indifferently,—"especially" as Mr. Alder observes, "when it is ascending a perpendicular surface, which it frequently does, for the purpose of suspending itself by its byssus. The byssal aperture is about half way up the foot, on the posterior surface, from which the animal produces a very delicate thread, and suspends itself freely by a single, almost inconspicuous fibre, strengthened by a double attachment at the top." Mr. Clark informs us, that though *Kellia suborbicularis* appears to be oviparous, the point admits of doubt, for he has observed a specimen containing a completely-formed testaceous young one.

This species ranges from low-water mark (though not, strictly speaking, ever a littoral shell) to sixty fathoms, abounding most in about fifteen or twenty. It lives in crevices of stones and shells, and *Laminaria*-roots, or gregariously in the mud, filling cavities of dead bivalves, such as *Tapes virginea*, and sometimes, though less frequently, quite free. It is generally distributed around our shores, ranging from Guernsey (S. H.) to Zetland; so generally, indeed, that though not reckoned one of our commonest species, a few localities only, illustrative of range in depth, may be mentioned:—Portland in fifteen fathoms; Penzance in twenty; Anglesey in twenty-five; Isle of Man in twelve to twenty-five (M'Andrew and E. F.); Northumberland, at the roots of seaweeds, &c. (Alder); Zetlands, at low water, and in five, ten, twenty, and sixty fathoms (M'Andrew) all round the west coast. In three to ten fathoms in Clew, Clifden, and Killery bays (W. Thompson,

R. Ball, and E. F). Ranging to Bergen, in Norway, northwards, and to the Mediterranean, southwards. It is a crag fossil.

### K. NITIDA, Turton.

Minute, white ; not more than one primary tooth in either valve.

Plate XXXVI. fig. 3, 4.

*Lepton nitidum*, TURT. Dithyra Brit. p. 63.—FLEM. Brit. Anim. p. 429.—Brit. Marine Conch. p. 49. — MACGILLIV. Moll. Aberd. p. 278.—BROWN, Ill. Conch. G. B. p. 111.

The dentition of this shell, which has a primary tooth in each valve, by no means agreeing with the characters assigned to the hinge of *Lepton* by Turton (it is, moreover, closed at the sides, and not a "little open"), we are compelled to remove it from that genus to the present, of which we regard it as a somewhat aberrant species.

From its rare occurrence, and its very insufficient description in the pages of the "Conchylia Dithyra Britannica," it has generally been conjectured to be the young of the *Lepton squamosum*, to the fry of which, except in shape, it bears but little resemblance, the characteristic punctures being clearly manifest in all stages of that species: it is far more liable to be confounded with the young of *K. suborbicularis*, from which, however, its more compressed shape and solitary apical tooth, suffice to distinguish it. Its white, thin, and subdiaphanous valves, which, when fresh, are covered with a shining ochraceous epidermis (variable in depth of tint, being occasionally very pale), reflecting a little the prismatic colours, are much depressed, excepting upon the umbonal region : the compression is nearly equal on both sides. The shape is nearly elliptical, but rather abbreviated, the surface devoid of all sculpture, and the ventral margin but little convex in the middle, though arcuated at both extremities. The sides are very nearly equal, and the dorsal edges, which decline so slightly as almost to be parallel with the lower margin, are nearly equally elevated, and each a little convex. Both the front and hinder outlines are arcuated and not angular, and the two extremities are nearly equally broad. That which is rather the shorter, and which, reasoning from analogy, we have termed the anterior, is rather the more obtuse; the scarcely longer posterior side is, if anything, rather the more attenuated above, from the more oblique uninterrupted arcuated sweep of the dorsal margin. The beaks are distinct, but not prominent, and scarcely lean to either side, yet if at all to the shorter one. The hinge of both valves displays a single narrow erect and obliquely slanting apical tooth (which seems rather more conical in the right one), on either side of which extends a distinct lateral lamina (these are almost double in the left valve, but the upper or outward set are very obscure), the front one shorter and immediately adjacent, the hinder less approximate and more produced. These lamina, which are in advance of the hinge-margin, lean over it in the right valve, and, especially in front, curl, as it were, outward.

The extreme length of the largest specimens is scarcely the sixth of an inch, and their breadth is rather less.

The original locality of this species was Torbay, where a few examples were procured from corallines by Dr. Turton. Mr. Lyons (of Tenby) acquired his specimens from the coral-sand of Bantry Bay, and a single broken valve (apparently belonging to this species) was taken by Mr. Jeffreys near the Island of Skye. Professor Macgillivray states, that he has taken it in shell-sand from the beach which lies between the mouths of the Dee and the Don.

The figure of *Lepton fabagella* in Conrad's "American Marine Conchology," is not unlike (pl. 11, f. 3) this species in general appearance, but the hinge exhibits no primary tooth.

### K. (PORONIA) RUBRA, Montagu.

Minute, tinged with red or green.

Plate XXXVI. fig. 5, 6, 7 (as *Poronia rubra*), and (Animal) Plate O. fig. 3.

*Cardium rubrum*, MONT. (not REEVE) Test. Brit. p. 83.—Linn. Trans. vol. viii. p. 66. —WOOD, General Conch. p. 213. — DILLW. Recent Shells, vol. i. p. 131.

*Tellina rubra*, TURT. Conch. Diction. p. 168.

*Kellia rubra*, TURT. Dithyra Brit. pp. 57, 258, pl. 11, f. 7, 8. — FLEM. Brit. Anim. p. 430. — Brit. Marine Conch. p. 51. — MACGILL. Moll. Aberd. p. 277.—HANL. Recent Shells, p. 43, suppl. pl. 9, f. 49.

*Bornia seminulum*, PHIL. Moll. Sicil. vol. i. p. 14, pl. 1, f. 16, and vol. ii. p. 11. —DESH. Exp. Scien. Algérie, Moll. pl. 43, f. 8 to 11, and pl. 43 A, f. 6, 8 (anatomy).

*Poronia rubra*, RECLUZ, Revue Cuv. Zool. 1843, p. 175.—HANL. in Brit. Mar. Conch. p. xxv.—CHENU, Ill. Conch. Poronia, p. 3.

*Lasæa rubra*, BROWN, Ill. Conch. G. B. p. 93, pl. 36, f. 17, 18.

This minute shell is strong for its size, more or less ventricose, semi-transparent, devoid of lustre, of a rich purplish red, or of various intensities and shades of yellow stained with purplish rose at the longer extremity, and mottled or banded with the same near the umbones; more rarely of a dirty greenish hue or almost destitute of colour. The form is somewhat variable, but generally is oval-orbicular, longer than broad, and always more or less oblique; more rarely the breadth and length are equal, and the shape consequently approaching to orbicular. The surface, although not perfectly smooth, is devoid of any visible sculpture, and does not possess any umbonal fold or ridge; the beaks are touching, prominent, but very blunt, and do not apparently lean to either side; the umbones themselves are very wide. The sides are unequal; the posterior occupying at least three-fifths of the entire length. Both sides are rounded at their extremities; the hinder, which is very slightly tapering, the more regularly; the front, which is likewise the broader, the more obtusely so. The ventral edge is simply and distinctly arcuated; the front dorsal margin is short, straightish, and but moderately sloping; the hinder dorsal edge scarcely declines at all, but is straight near the beaks, and then more or less arcuated. There is no lunule, nor any trace of one. The colour of the interior, which often exhibits a resinous gloss, is usually deeper than that of the exterior; the hinge-margin is almost invariably stained dark purplish red, and the margin is perfectly entire and closed all round. The dentition of the right valve consists of a very small sharp central tooth and a rather larger widely diverging one just behind the apex; the anterior hinge-margin is extraordinarily thickened in both valves, forming a broad but shallow bed for the elongated cartilage that runs along the inner edge of it, which slopes inwards. The other valve contains a rather approximate, small anterior lateral tooth, and an oblique tooth-like laminar elevation of the hinge-margin (which is not unfrequently surmounted near its commencement with a minute apical denticle) just behind the apices. Specimens at all worn, or when examined with a lens of low power, only exhibit a broad hinge-margin with a wide triangular excavation just beneath the apices of the shell.

The average length is about the seventh of an inch, and the breadth is nearly a quarter less.

Minute as this shell is, its animal has not escaped examination; Mr. Alder, Mr. Clark, and M. Deshayes have independently examined its structure with care. It is of a white colour, and has the mantle closed posteriorly, gaping in front, where the broad-based, strap-shaped, stout foot is protruded. Its margins appear to be quite plain and free from tentacles. Anteriorly they are produced so as to form a hyaline, tube-like canal, differing from that of *Kellia suborbicularis*, as was first observed by Mr. Alder, in being open below. Into this anterior siphon-like organ the foot is sometimes pushed. The anal aperture is not prolonged into a tube. According to Mr. Clark, this animal is viviparous, and in the month of July he found its ovarium full of perfectly-formed, minute testaceous young. This is quite a new fact in the economy of these bivalves, and very interesting as reminding us of a similar habit in the *Cylas*, to which the sub-genus *Poronia* (as well as *Kellia* proper) bears a striking external resemblance.

This is a strictly littoral species, living gregariously in the crevices of rocks, among congregations of barnacles and the roots of *Corallina*, *Lichina*, and *Fucus*, between tide-marks. It is not so generally diffused as it is locally plentiful. Among localities may be enumerated Torquay (S. H.); Burrow Island (S. H.); Herm near Guernsey (S. H.); Exmouth (Clark); Dartmouth, where some specimens occurred in the crevices of a mass of stone dredged from seven fathoms,—a very exceptional locality (M'Andrew and E. F.); Whitesand Bay and Falmouth (Jeffreys); Glamorganshire, Tenby, and St. David's (Jeffreys); Isle of Man, very abundant all round the coast wherever there is rock (E. F.); Scarborough (Bean); Northumberland, near Whitley (Alder); and at the roots of *Lichina pygmæa* on the rocks below Bamborough Castle

(Thompson); Inner and Outer Hebrides (Barlee); Orkneys (Thomas); Aberdeenshire (Macgillivray). "On each side the coast of Ireland. Found among *Mytili* growing on the rocks at the Skerries off Portrush, and about the roots of *Algæ* growing between tide-marks, Belfast Bay and coast of Clare" (W. Thompson).

It appears to be generally distributed through the North and South Atlantic, ranging into the Mediterranean. The *Kellia rubra* of North America, judging from the expression of Gould (Invert. Massachuss. p. 60, f. 33), seems to differ from this species, although, perchance, as that admirable describer observes, not essentially so. The hinge of Mediterranean examples, received from Dr. Phillippi, is much more developed, and the teeth longer and more manifest than in our British shells.

## LEPTON. TURTON.

Shell equivalve, suborbicular, subequilateral, compressed, surface shagreened or smooth, gaping slightly at the sides; beaks acute; margin plain. Hinge composed of a pair of teeth-like lamina on each side of a triangular central excision in one valve; a primary apical tooth in front of a subtriangular excision of the hinge-margin, and flanked on each side by a sublateral lamina on the other. Pallial impression simple.

Animal compressed, mantle freely open in front, its margin extending considerably beyond the shell, and bearing superiorly a fringe of filaments, one of which is much larger than the rest. A short siphonal tube, with single aperture at the larger end of the shell. Foot thick and tapering, keeled and disked, furnished with a byssal groove. Branchial leaflets two on each side, and separate.

This very curious genus has close affinities with *Kellia*, but is sufficiently distinct in both shell and animal. As yet, besides the British species, only one other form of it has been described, viz., the *Lepton fabagella* of Conrad, from the shores of the United States; there are, however, doubts respecting the true position of the latter.

### L. SQUAMOSUM, Montagu.

Not minute, flat, contracted above, retuse at the ventral edge; central tooth very small.

Plate XXXVI. fig. 8, 9, and (Animal) Plate O. fig. 6.

*Solen squamosus*, MONT. Test. Brit. p. 565. — Linn. Trans. vol. viii. p. 48. — TURT. Conch. Diction. p. 164.—WOOD, General Conch. p. 140. — DILLW. Recent Shells, vol. i. p. 70.

*Lepton squamosum*, TURT. Dithyra Brit. p. 62, pl. 6, f. 1, 2, 3. — FLEM. Brit. Anim. p. 429.—Brit. Marine Conch. p. 49.—BROWN, Ill. Conch. G. B. p. 111, pl. 40, f. 7, (very badly).—SOWERBY, Conch. Manual, f. 62.

*Lutraria squamosa*, GRAY, Annals of Philosoph. 1825. — HANL. Recent Shells, vol. i. p. 28, suppl. pl. 9, f. 47.

*Lepton squammeux*, CHENU, Traité Elem. p. 47, f. 148.

In whatever point of view we regard the *Lepton squamosum*, whether as almost the sole representative of a rare and (geographically) limited genus, or for the extreme scarcity of its appearance in a perfect state, or as distinguished by a most delicate and almost unique style of sculpture, it will hardly fail to excite a more than ordinary interest. The valves are so remarkably compressed as nearly to be flat; they are semi-pellucid, thin, and extremely brittle. In shape they are of a suborbicular oval, and decidedly longer than broad; they are of an uniform white both within and without, are rather glossy when fresh, and, in addition to a few antiquated lines of growth, are covered with a most minute shagreen-like sculpture, the surface appearing under a lens of small power to be punctured all over, but under the microscope to be most crowdedly set with the most minute tubercles imaginable. The ventral margin is retuse in the middle, and rises with nearly equal arcuation at either extremity. The sides are very nearly equal, and are rounded at their extremities, both the front and hinder edges being well arcuated, and their chief swell rather below than above the middle; from this point the edges incline inwards, so that the dorsal margin, which on the shorter side declines convexly and but slightly, whilst it almost rises on the longer and very slightly broader side, is manifestly shorter than the lower one. The upper portion of the extreme margin of the longer side is rather more oblique and straight than the corresponding portion of the shorter one; hence, the former side projects rather the more below, and the latter is rather the more (but not quite) symmetrically rounded. The beaks, which scarcely appear above the dorsal line, are very acute, and hardly lean to either side. There is neither lunule nor umbonal ridge, and the dorsal edges do not bend inward on either side.

The interior is glossy, and adorned with fine radiating lines; the edges are quite plain. The hinge of the right valve consists of two short nearly parallel teeth-like laminæ, on either side of, and immediately adjacent to, a broad triangular central excision; of which the anterior set are rather the more abbreviated. The left hinge exhibits a narrow apical tooth, which curves slightly forward, behind which lies a subtriangular excision of the hinge-margin, and on either side an adjacent sublateral lamina; of which the anterior, which is decidedly the shorter, and occasionally somewhat resembles an oblique cardinal tooth, is separated from the central tooth by a narrow cavity.

Few examples exceed half an inch in length, and about three-eighths of an inch in breadth.

At the meeting of the British Association at Oxford, in 1847, the following interesting particulars respecting this Mollusk were communicated by Mr. Alder :—

" When lately dredging in Fowey Harbour, I fortunately met with a living individual of this rare genus, the *Lepton squamosum*, which I have kept alive for a fortnight, and am thus enabled to supply some account of its characters and habits. The animal has proved very interesting, on account of its variation from the usual form of the bivalve Mollusca. It is of a transparent white. The mantle is very large, and, when fully extended, is at least one-third larger than the shell, passing considerably beyond it in the free part, which is thin and transparent, with a smooth undulating margin. Between this and the shell there is a fringe of filaments, extending completely round to the umbones, but largest and most conspicuous on the back. There is, however, a single filament, much stouter and longer than the rest, which, when the animal is crawling, is waved to and fro, like a tentacle, apparently feeling the way as it goes. The other filaments are comparatively motionless, floating loosely in the water, though capable of being thrown out or withdrawn, at pleasure. The mantle is open for about three-fourths of its circumference, being united for a short space before and behind : in the latter part it forms a short siphon, with a single aperture. The foot is very large, rather thick and tapering in front, with a slight nipple-like termination ; behind, it extends into a long pointed heel, with thin margins, which are divided for about half the length of the base, forming, in that part, a kind of disc, the edges of which can be either closed or expanded, as in the foot of the *Nuculæ*. As may be imagined from the size of the foot, it has the power of crawling about very freely, and sometimes it also swims inverted on the surface of the water in the manner of the gasteropods, the hinder part of the foot being then unfolded into a disc: but its favourite position is that of repose, suspended freely in a perpendicular position, with the umbones downwards, by three or four threads, so fine, that they cannot be seen by the naked eye, and even with a magnifier can only be observed in certain positions of light. The byssal aperture appears to be about the centre of the foot. When the animal is withdrawn, the shell can be completely closed, but usually the valves are held a little open, and the mantles protruded beyond them. The siphon is at the longer end of the shell. The branchial leaflets are two on each side, attached to the inside of the mantle."

As long ago as June, 1835, this remarkable creature had been drawn and noted by Mr. Clark, at Exmouth, but his notes remained unpublished. They agree in most particulars with those of Mr. Alder, the only essential difference being his observation "of *two* very small orifices, a little separate from each other, above the posterior end of the foot."

This scarce shell is very rarely obtained entire, dead single valves being the usual condition of cabinet specimens, and good examples of them are not common. It inhabits the laminarian and coralline regions chiefly, towards the south and west. Montagu, its discoverer, took a solitary example in Salcomb bay. On the south coast of England it occurs,—in fifteen fathoms, West Bay of Portland, and in twenty-eight fathoms off Plymouth (M'Andrew and E. F.); Exmouth (Clark); Torbay (Alder); most numerous at

Tenby (S. H.); in twelve fathoms, Anglesea (M'Andrew). On the Scottish coast it has been taken at Oban (Barlee) and off Skye (Jeffreys). On the Irish Coast it was first taken in twenty fathoms, Cove of Cork (E. F. and R. Ball); since in Bantry Bay (M'Andrew); Arran Isles and Birterbuy Bay (Barlee).

Mr. M'Andrew has dredged this curious Mollusk on the Atlantic Coast of Spain.

### L. CONVEXUM, Alder.

Minute, a little swollen, not contracted above; punctures longer than broad; central tooth rather large.

Plate XXXVI. fig. 10 (magnified).

*Lepton convexum*, ALDER, Catalogue of the Mollusca of Northumberland and Durham, p. 93.

"Shell rather convex, transversely ovate, white; covered with minute transversely oblong punctures; hinge with the central tooth rather large, and the lateral laminæ small.

"A single valve of a minute shell, with these characters, has occurred to us at Cullercoats. It is evidently a *Lepton*, and differs from the *L. squamosum* in being rather more convex, in having the punctures of the surface oblong instead of circular, and in the greater proportional size of the tooth. These seem to indicate a specific distinction; but as the specimen is scarcely a line in diameter, and probably young, we cannot speak very confidently. The nucleus on the umbo is, however, so much smaller than that of *L. squamosum*, that we conclude it never attains the same size."

Although since the publication of this interesting new species a live and perfect individual (delineated in our engraving), in the highest state of preservation, clothed with a gorgeous epidermis reflecting prismatic hues of garnet-red and emerald-green, has been dredged from Bantry Bay in Ireland by Mr. M'Andrew, we have given Mr. Alder's description verbatim, refraining from any additional particulars, lest, from our present limited state of knowledge, our details should prove incidental to the specimens, and not essential to the species. The contour, we may remark, is by no means so elliptical as in the fry of *squamosum*, but abbreviated or rounded oval, not contracted above and dilated below, as in the preceding species, but of nearly equal length throughout; the ventral margin is well arcuated, and no trace is exhibited of that basal retusion which seems constant in the adult of our larger *Lepton*. The texture is not particularly thin and fragile, as would probably be the case were it merely the fry of that species; the shoulders seem of nearly equal elevation, and the inclination of the broad and prominent umbone is (if at all) towards the longer side of the shell. The punctures diminish in size and number towards the lower edge.

Mr. Jeffreys possesses a minute *Lepton*, taken at Exmouth by Mr. Clark, which in convexity and outline agrees very well with this shell; its punctures, however, seem scarcely transverse, and the extreme delicacy of its transparent valves deters us from an examination of the hinge. The exterior of it exhibits a very beautiful appearance from the commingling of the exquisitely fine radiating lineoles, which exist in the substance of the shell itself, with the incipient punctures.

## GALEOMMA. Turton.

Shell thin, transversely oval, equivalve, subequilateral, gaping widely in front; its surface longitudinally striated and decussated; beaks minute, acute; cartilage pits under the beaks, small; no hinge teeth; ligaments internal. Pallial impression simple, muscular scars unequal.

Animal oval, mantle very large, double margined, tuberculiferous; closed in front; siphonal openings posterior, two. Foot long, ligulate, byssiferous, perforate, projecting from an anterior opening of the mantle; two pair of branchial leaflets; mouth with large lips and developed labial palps.

This very curious genus was first made known by Turton in 1828. The same species was afterwards strangely described as a *Hiatella* by Costa, and an antarctic form was figured in one of the French voyages as a *Psammobia*. Its true systematic position has been much disputed. That, however, it has no affinities with the *Tubicolæ* or *Tellinidæ* a glance at either shell or animal will suffice, and it seems strange that conchologists of experience should ever have so placed it. Its true position is unquestionably about where we now introduce it, viz. as a link between the *Kelliadæ* and the *Arcadæ*. With the latter family its alliances have been clearly shewn by Mr. Clark. M. Mittre holds that it is closely connected with the *Tridacnidæ*, and should form the type of a family parallel with that tribe.

### G. Turtoni, Sowerby.

Plate XXXVI. fig. 11, and (Animal) Plate O. fig. 5.

*Galeomma*, Turton, Zool. Journal, vol. ii. p. 361.—Ann. Nat. Hist. vol. iv. p. 92, pl. 3, f. 4.

„ *Turtoni*, Sowerb. Zool. Journ. vol. ii. p. 361, pl. 13, f. 1.—Flem. Brit. Anim. p. 466.—Brit. Marine Conch. p. 33, f. 72.—Brown, Ill. Conch. G. B. p. 114, pl. 23, f. 15, 16.—Sowerby, Genera Shells, Galeomma, f. 1, 2, 3.—Sow. Conch. Manual, f. 58, 59.—Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 180.—Desh. Elem. Conch. pl. 11, f. 13 to 17.—Reeve, Conch. System. vol. i. pl. 54, f. 1. 2, 3.—Phil. Moll. Sicil. vol. ii. p. 18, pl. 14, f. 4.—Hanl. Recent Shells, p. 59, suppl. pl. 9, f. 42.—Desh. Exp. Scient. Algérie Moll. pl. 82 (anatomy), and pl. 81, f. 11 to 15.—Mittre, Ann. Sc. Nat. 3rd series, vol. vii. p. 169, pl. 5, f. 1–8.

*Hiatella Polii*, Costa, Ann. Sc. Nat. 1st series. vol. xv. p. 100.

*Parthenope formosa*, Scacchi, Oss. Zool. p. 8, pl. 19 (ac. to Phillippi).

For the discovery and publication of this most interesting shell, the student of nature is indebted to Dr. Turton, who, however he may have erred in his system of arrangement and in unnecessary subdivision of species, did assuredly introduce to our notice some most important generic and specific forms of the testaceous Mollusca. This delicate shell, which was named by Mr. Sowerby in his honour, is of a most fragile texture, and of a pure semi-transparent white. Its shape is a produced oval, and its valves at the umbonal region are decidedly convex, but elsewhere a little compressed; at the most it possesses a slight pearly gloss, but, excepting in fine condition, is destitute of any lustre. Its surface is traversed from the beaks to the margins with most crowded irregular-looking elevated lines, which are extremely fine, and are continually bifurcating; those on the central area radiate downwards, but those upon the somewhat compressed lateral areas diverge upwards. Most exquisitely minute and wavy concentric raised striulæ decussate the preceding, but demand, in many specimens, the most searching scrutiny for their detection. The entire base of the shell is really gaping; that is to say, when the dorsal margins touch throughout, the ventral edges do not touch at all. This hiation is contracted in the middle, and pointed at each extremity, the former being caused by a shallow and rather broad depression, which is evident near the lower margin, just under the beaks. These latter are minute and by no means prominent, but easily discernible on account of their acuteness. The somewhat tapering extremities of both the sides, which are nearly equal, are tolerably rounded. The dorsal edge is typically rectilinear, and not sloping on either side, the rounding of the extremities being effected by the anterior and posterior margins; sometimes, however, it is very slightly convex and a little declining on either side; the ventral is retuse in the middle, but convex towards each extremity. There is no distinct umbonal ridge; the interior is white, and the cartilage pits, which lie under the beaks in the narrow hinge-margin, are extremely small, and somewhat triangularly linear: the hinge is destitute of teeth.

The animal of *Galeomma Turtoni* has been described and figured by M. Mittre from life, and some elaborate representations of it are given by M. Deshayes in his "Mollusques d'Algérie." In 1835, it was met with by Mr. Clark at Exmouth, and ample notes and sketches taken, but not published. We have collated these with the account published in the "Annales des Sciences Naturelles," for March, 1847, by M. Mittre, and thus drawn up the following description, never having been so fortunate as to have had an opportunity of examining and delineating this rare Mollusk in a living state.

Animal white, thick, shaped like the shell, but larger than it. The mantle is greatly developed, and closed in front; it has a thickened, furbelowed double border, the outer part lining the margin of the shell, and furnished with a series of rounded distant tubercles, the central ones largest, all placed at regular distances, and of a brilliant white-frosted aspect. There are nine or ten on each side, the intervals between them furnished with a fringe of fine short white triangular filaments. Both observers quoted compare the tubercular bodies to the so-called eyes of *Pecten*. Anteriorly the mantle is open for the passage of a long, cylindrical, very extensile foot, furnished with a byssiferous organ at its base: its margins pout out beyond the shell in a lip-like manner. Above the mouth is a short tube, apparently imperforate, and furnished at its extremity with a small process, reminding us of the organ at the anterior end of *Lepton*. Posteriorly it forms two short tubes, an upper and small one, which is the anal one, and a lower and larger branchial siphon, the former with even, the latter with sinuated margins to its orifice. There are a pair of branchial leaflets on each side, and also a pair of labial leaflets, more coarsely pectinated than the branchial.

Mr. Clark states that it adheres so strongly by means of its byssus, as, when the animal was taken, to require some force to detach it from the rock. "During twenty-four hours," he states, "we kept it alive in a saucer, and three or four different times it spun a byssus, once detaching itself and leaving the threads behind, crawling to a short distance and then again attaching itself. We had the good fortune to witness the operation. From the slit at the root of the foot a light green glutinous matter was poured out with such rapidity, that in less than five minutes the animal was fixed. When detached it opened ts valves, laying them on each side nearly flat, and marched across the saucer by means of its foot with such rapidity that ten could scarcely be counted: it seemed to be considerably assisted by the large margins of the mantle." M. Mittre states that it lives on the roots and leaves of fuci at a depth of from three to four fathoms, and looks like beautiful pearls when seen beneath the water. He also observes that it is viviparous in the strictest sense of the term.

Mr. Alder, in a letter received whilst these sheets were passing through the press, urges attention to the skin covering the shell of *Galeomma.* "Phillippi," he observes, "mentions it; but I think he passes it over too slightly, as it appears to me to make the shell really an internal one, the only instance of such among bivalves (?). In *Mytilus* and *Solen* the horny epidermis of the shell is a continuation of that of the animal, but in other respects does not differ from the regular epidermis of shells. In *Galeomma* the covering of the shell is a combination of the true skin, and consists of two layers; the lower of which is slightly muscular, and under the microscope the muscles may be seen interlacing each other in all directions. The outer layer is granular, and is covered with tubercles, which possibly, when the animal is alive, may rise into papillæ. The structure of the shell appears peculiar."

Phillippi, in his "Enumeratio Molluscorum Siciliæ," vol. ii. p. 18, states, "Epidermis in hoc genere productio cutis manifesta; etenim facile a testa sejungitur et pallio adhæret." He states that the animal was first observed by Scacchi.

The specimens described are five-eighths of an inch in length by nearly three-eighths in breadth; they were taken alive by Mr. Hanley in the little islet of Herm near

Guernsey, where they are only procurable at very low tides in an extremely limited space, where a few can occasionally be obtained by heaving over some of the largest stones, beneath the hollowed bases of which the valves are seen adhering to the rock, not in the ordinary closed position of bivalves, but flatly expanded, and covered with a thin white skin. Single valves in a worn condition are found mixed with innumerable dead *Rissoæ* in the tiny bay of the islet, which is so noted for its minute shells; but even in that state they are not abundant. Mr. Metcalfe and Mr. Barlee have found them in the same locality. Mr. Clark procured it at Exmouth. The original locality given by Dr. Turton was the British Channel, from whence he obtained them by the assistance of a dredge. According to Mr. G. B. Sowerby, a single valve marked "Ireland" was contained in the collection of Humphreys. It appears to be frequent in the Western Mediterranean.

## CYCLADIDÆ.

A GROUP of freshwater mollusks, whose shells resemble those of *Kellia* or of *Astarte*, but whose soft parts present structures conspicuously distinguishing them from the tribes to which either of those genera belongs. The shells are more or less tumid, equilateral or inequilateral, thin, as in our British forms, or thick, as in the foreign *Cyrenæ*, smooth or concentrically striated and furrowed, and covered with an epidermis. The hinge is furnished with cardinal and lateral teeth, and the ligament is external. The animals have plain-edged mantles, open in front ; siphonal tubes produced, and either partially separated or completely united to their unfringed extremities ; and a large linguiform foot. They live buried in the mud of slow streams, lakes, ponds, ditches, and springs. Our native species are all ovoviviparous. They breed readily in confinement, and often exhibit considerable activity, ascending the sides of the vessel in which they are placed.

### CYCLAS. BRUGUIÈRE.

Shell equivalve, thin, suborbicular, more or less inflated, slightly inequilateral, closed, smooth or concentrically striated. Cardinal teeth minute (in British species), one in the right and two in the left valve ; lateral teeth developed. Ligament external, more or less conspicuous, placed on the larger side of the shell. Muscular and pallial impressions indistinct, the latter with a sinus.

Animal suborbicular, its mantle freely open in front, and anteally united posteriorly, to form a produced siphon, divided at its extremity into two nearly equal tubes, which, as well as the margins of the mantle, are not fringed. Foot large, linguiform, very extensile. Labial palps long and lanceolate.

### C. rivicola, Leach.

Oval-globose, striated; umbones obtuse; dorsal area with a small lunular impression; ligament manifest.

Plate XXXVII. fig. 1, 2, and (Animal) Plate Q. fig. 1.

*Cardium nux*, Da Costa, Brit. Conch. p. 189 (in part).
*Tellina cornea*, var. β. Linn. Trans. vol. viii. p. 59. — Turt. Conch. Diction. p. 180.
*Cardium corneum*, (Thames var.) Mont. Test. Brit. p. 86.
*Cyclas cornea*, Draparn. Moll. Ter. et Fluv. France, p. 128, pl. 10, f. 1, 2, 3.— Brard, Coq. Ter. et Fluv. de Paris, p. 219, pl. 8, f. 2, 3.
*Cardium amnicum*, Dorset Catalog. p. 32.
*Cyclas rivicola*, Leach, in Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 267. — Turt. Dithyra Brit. p. 248, pl. 11, f. 13. — Flem. Brit. Anim. p. 452.—Turt. Manual L. and F. W. Shells, p. 12, pl. 1, f. 1.— Jenyns, Trans. Cambridge Phil. Soc. vol. iv. p. 294. — Gray, Manual L. and F. W. Shells, p. 279, pl. 1. f. 1. — Brown, Illust. Conch. G. B. p. 93, pl. 39, f. 16, 17, 18. — Pfeiffer, Deutsh. Land und Sussw. Mol. p. 121, pl. 5, f. 3, 4, 5.— Sowerby, Genera of Shells, Cyclas.—Kickx, Moll. Brabant, p. 86.—Desh. Encyc. Méth. vol. ii. pt. 2, p. 36.—Sow. Conchology. Manual, f. 111. — Reeve, Conch. Systematica, pl. 62. Hanley, Recent Shells, vol. i. p. 89, pl. 5, f. 90.
Encyclopédie Méthod. Vers, pl. 302, f. 5.

This large *Cyclas* (for, although of no peculiar magnitude as a shell, we know of no other species in its genus which surpasses its dimensions) is of a nearly oval form, and slightly, yet distinctly, inequilateral. It is moderately ventricose, and comparatively strong and opaque: the swell is chiefly superior, and the diminution of it on either side of the beaks takes place without any marked inequality, or any flattening of the surface adjacent to the dorsal slopes. The valves are regularly girt with more or less closely-disposed elevated concentric striæ, which are very manifest below and anteriorly, but usually become obsolete upon the umbonal region. The colour of the glossy epidermis is brownish-green, with usually two or three darker zones, and occasionally (but rarely) some indistinct dusky linear rays towards the ventral margin, near which latter the surface almost invariably assumes a yellower cast. Both extremities are rather broad; that of the slightly shorter anterior side is more rounded than the hinder termination, which has a tendency to biangulation, although the corners are generally rounded off. The ventral edge is moderately and equably curved; the declination of either dorsal edge is but trifling, and the curvature but slight. The ligament is distinct, and even slightly projecting at its extremity, and is environed and succeeded by a yellowish stain, where the dorsal edge is likewise somewhat flattened. The umbones, which are tumid, obtuse, and usually of a paler tint than the prevailing ground-colour, are preceded by a narrow and not profoundly impressed lunule, which is also of a yellowish hue; both dorsal markings are occasionally rendered more vivid by a not unfrequent darker stain at both extremities of that margin. The interior is of a bluish-white.

The ordinary length of the finer specimens is ten lines and a half, and its breadth about two-thirds of an inch.

The tubes of the animal are tinged with rose or tawny, and when fully protruded are nearly equal, the branchial, if either, being longest. The foot is large, white, and linguiform; the mantle white, the labial palps long, triangular, and strongly striated. It is sluggish in its habits.

The most prolific locality is the River Thames; it is found likewise in the New River (Baily); the Trent (Jenyns); the Lea (S. H.); the canals about Leamington, in Warwickshire (Thompson); streams in Yorkshire (Bean). In a pond at Enville, Staffordshire, a young specimen (Jeffreys). It has not been taken either in Scotland or Ireland. On the Continent it occurs in Germany, France, and Belgium; and as a fossil, is found in the Pleistocene freshwater beds of the south of England.

### C. CORNEA, Linnæus.

Suborbicular, almost smooth; umbones obtuse; ligament inconspicuous.

Plate XXXVII. fig. 3, 4, 5, 6.

*Tellina cornea*, LINN. Syst. Nat. ed. 12, p. 1120; Fauna Suecica, ed. 2, p. 517. — PENNANT, Brit. Zool. ed. 4, p. 89, pl. 49, f. 36. — Linn. Trans. vol. viii. p. 59.—DONOV. Brit. Shells, vol. iii. pl. 96.— TURT. Conch. Diction. p. 179. — SCHRÖTER, Flussconchylien, p. 189 (partly), pl. 4, f. 4. — DILLW. Recent Shells, vol. i. p. 104 (chiefly).

„ *rivalis*, MULLER, Verm. Terr. et Fluv. vol. ii. p. 202.

*Cardium corneum*, PULTENEY, Hutchins, Hist. Dorset, p. 31. — MONT. Test. Brit. p. 86.—Dorset Catalog. p. 32.

*Cyclas rivalis*, DRAPARN. Moll. Terr. et Fluv. France, p. 129, pl. 10, f. 4, 5 (not well).—BRARD, Coq. T. et Fl. Paris, p. 222, pl. 8, f. 4, 5 (badly).

„ *cornea*, LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 268 (not vars.).— TURT. Dithyra Brit. p. 248, pl. 11, f. 14.—FLEM. Brit. Anim. p. 452.—TURT. Manual. L. and F. W. Shells, p. 13, pl. 1, f. 2. — JENYNS, Trans. Cambridge Phil. Soc. vol. iv. p. 295. — GRAY, Manual L. and F. W. Shells, p. 280, pl. 1, f. 2.— BROWN, Illust. Conch. G. B. p. 93, pl. 39, f. 19. — PFEIFFER, Deutsch. Land und Süssw. Moll. pt. 1, p. 120, pl. 5, f. 1, 2.— NILSSON, Moll. T. et Fl. Sueciæ, p. 96. — KICKX, Moll. Brabant, p. 87. — PHILIPPI, Moll. Sicil. vol. ii. p. 30. — GRAS, Moll. T. et Fl. de la France, p. 72, pl. 6, f. 2.—HANLEY, Recent Shells, vol. i. p. 89, Suppl. pl. 9, f. 15.

*Tellina stagnicola*, Shepp. Linn. Trans. vol. xiv. p. 150.
*Cyclas flavescens*, Macgilliv. Moll. Aberdeens. p. 246.
„ *citrina*, Brown, Ill. Conch. G. B. p. 132, pl. 39, f. 37 (from type).

The most frequent, variable, and widely-diffused of our freshwater bivalves is incontestably the *Cyclas* we are about to describe. The shape is ordinarily suborbicular or rounded-ovate, but is occasionally more produced: the valves are never compressed, and usually are swollen, or at least ventricose; they are moderately thin, not diaphanous, but little shining, and with their surface, which is never striated in a regular manner, although there are indistinct concentric striulæ on many individuals, of an ashy-olive colour, or of a more or less squalid yellow, either uniform or stained above with the former, and below with the latter tint; occasionally, too, there are yellowish zones on an olivaceous ground, or the shell is altogether of a brownish hue. The diminution in convexity is nearly equal on either side of the umbones; there is no flattening of the lateral dorsal surfaces. The curve of the ventral margin is generally a little diminished in the centre; the front dorsal edge is the less elevated, but the more convex and sloping; the almost horizontal hinder dorsal edge merges, without marked angulation, into the more or less arcuated and little oblique posterior margin, so that both extremities appear more or less rounded, but that of the scarcely shorter anterior side assumes, from the superior dorsal declination, a more attenuated form. The umbones are broad and obtuse, and do not ordinarily lean to either side; they are not preceded by any distinct lunular impression, but there is frequently a deceptive dusky stain of colouring matter both there and on the opposite side of the beaks; the ligament, too, is so small, narrow, and depressed, as almost to be totally imperceptible.

There is a subglobose variety (apparently the *stagnicola* of Mr. Sheppard) which is flattened towards the ventral margin, and has the pellucid and swollen umbones peculiarly prominent.

The dimensions of the larger typical form are six lines and a quarter in length, and five lines in breadth; of the variety, five lines and a half in length, and four and three-quarters in breadth.

The animal is white, its subelongated siphonal tubes tinted with pale flesh-colour. Mr. Jenyns observes, that the superior tube is subconic, with a small aperture, the inferior cylindric and truncate, with a wider aperture. Mr. Glover notes on the variety *flavescens*, "from running water, under stones," that its animal is straw-coloured.

For "this very common species, a general inhabitant of rivers, ponds, and ditches throughout the country, which appears to thrive equally well both in running and in stagnant water" (Jenyns), we do not cite any particular localities, reserving the space thus gained for less thoroughly investigated species.

*Cyclas cornea* is generally distributed throughout Europe, and occurs fossil in freshwater strata of the Pleiocene age in the valley of the Thames.

### C. CALICULATA, Draparnaud.

Shape more or less rhombic; umbones narrow, more or less prominent, capped.

Plate XXXVII. fig. 7 (as *lacustris*), and (animal) pl. O, fig. 7.

*Cyclas caliculata*, DRAPARN. Moll. Ter. et Fluv. France, p. 130, pl. 10, f. 14, 15.—TURT. Manual L. and F. W. Shells, p. 14, pl. 1, f. 3.—BROWN, Illust. Conch. G. B. p. 94, pl. 39, f. 28.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 269.—PFEIFF. Deutsch. Land und Süssw. Moll. pt. 1, p. 122, pl. 5, f. 17, 18.—NILSSON, Moll. T. et Fl. Succiæ, p. 99.—KICKX, Moll. Brabant, p. 89.—DESH. Encycl. Méth. Vers, vol. ii. pt. 2,

p. 37.—Hanley, Recent Shells, vol. i. p. 89.—Gras, Moll. T. et Fl. de la France, p. 73, pl. 6, f. 5.—Philippi, Moll. Sicil. vol. ii. p. 214.

*Cardium lacustre*, Mont. (1803) Test. Brit. p. 89.

*Tellina lacustris*, Linn. Trans. vol. viii. p. 60.—Turt. Conch. Diction. p. 180.—Wood, General Conch. p. 197, pl. 47, f. 5.—Dillw. Recent Shells, vol. i. p. 104.

*Cyclas lacustris*, Turt. Dithyra Brit., p. 249, pl. 11, f. 18.—Flem. Brit. Anim. p. 453. — Alder, Trans. Nat. Hist. Soc. Newcastle, vol. i. p. 40.—Gray, Manual L. and F. W. Shells, p. 281, pl. 1, f. 3. Brown, Illust. Conch. G. B. p. 94, pl. 39, f. 20.

This the most delicate and fragile of our *Cyclades* is of a slightly rounded subrhombic shape, almost smooth (at least, devoid of all regular striulæ), diaphanous, and scarcely inequilateral. Except upon the umbonal region, where the shell is moderately ventricose, the valves are compressed, not merely below, but also more or less on either side of the beaks. The surface is lustrous, and of a greyish ash-colour, and occasionally zoned also with yellow at the ventral margin, which latter is moderately arcuated, and rises rather the more anteriorly. The umbones, which lean a little forward, are narrow, very projecting, and as it were capped (their surface becoming suddenly elevated above the remaining area, as if surmounted by another pair of younger valves), furnish the peculiar feature by which the species may most readily be distinguished from its British congeners. The margin on either side of them is nearly equally elevated, declines but little, especially behind, and is scarcely convex. Both extremities are broad, and not very unequally; so the posterior which (especially in the young) is more or less subbiangulated, rather exceeds in width the rounded extremity of the slightly shorter anterior side. The ligament is small, inconspicuous, not elevated above the dorsal surface, and usually almost colourless.

We have described the smaller and more ordinary form, but a much more produced angulated and compressed variety, measuring occasionally seven lines by five and a half, has been taken in Clumber Lake by Mr. Jeffreys. That gentleman has likewise sent us for our inspection a peculiarly aberrant specimen from Cork (entirely agreeing with one taken by ourselves from a foul-smelling pool communicating with the river Lea; S. H.), wherein the projecting umbones are not capped at all, but the contour is precisely that of the preceding variety. In the two latter forms, the edges (especially the ventral) are straighter than usual, and the hinder dorsal edge is rather ascending than otherwise.

We have preferred, on reconsideration, the epithet *caliculata*, bestowed upon this species by Draparnaud, partly from its expressiveness, partly because that author is said by Dupuy and others (we have not seen a copy ourselves) to have published the name in 1801, in a Prodromus to his posthumous and larger work, and partly to avoid the confusion which our mention of the *C. lacustris* of the continental writers among our less positively indigenous species, would otherwise induce. The *Tellina lacustris* of Müller (1774), which seems too imperfectly defined for assured identification, is almost invariably cited for the following shell.

The animal, as observed by Mr. Jenyns, is entirely white. Its siphonal tubes are much elongated, and resemble those of *cornea*. The length of a fine individual was seven lines, and its breadth five and a half. There are two principal varieties; the first, which is of a rufous brown, is less pellucid and compressed and more rounded in contour than the type; the second, which resembles the preceding in the other points of diversity, is of a reddish cast, and displays but a slight degree of prominence at its blackish beaks.

It is by no means one of our commoner shells, and is apparently less infrequent in the north than in the more southern parts of England. Mr. Alder has found it near Newcastle, Mr. Bean at Scarborough (where it is not scarce), Mr. Thompson at Lichfield; and Capt. Brown records the vicinity of Manchester and the lakes of Westmoreland for its localities. Montagu met with it in Devonshire and Wiltshire, Mr. Jenyns at (var. 1.) Bookham Common in Surrey, and more sparingly in Cambridgeshire, and Mr. H. Strickland at Hornsea in Yorkshire. Mr. Jeffreys has taken it in the Clumber lake, Notts, and in the neighbourhood of Bristol.

In Ireland, observes Mr. Thompson, it is also rare and local, but occurs in the east and south; it has been taken from a pond in the Phœnix Park, the Grand Canal, and elsewhere in the vicinity of the metropolis; also at Cork, Youghal, &c.

On the Continent it occurs in Sweden, Germany, Belgium, France and Italy. The *C. partumeia* of Say, in despite of the ventricosity of the adult, is very closely allied, especially in outline, to this species, and may be regarded as its transatlantic representative.

### C. LACUSTRIS, Draparnaud.

*Cyclas lacustris*, DRAP. Moll. Terr. et Fluv. France, p. 130, pl. 10, f. 6, 7.—TURT. Manual Land and Fresh-water Shells, p. 14, pl. 1, f. 4.—GRAY, Manual Land and Fresh-water Shells, p. 17, pl. 1, f. 4.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 268. —C. PFEIF. Deutsche Land und Süssw. Moll. pt. 1, p. 122, pl. 5, f. 6, 7. — KICKX. Moll. Brabant, p. 88. — GRAS, Moll. Terr. et Fluv. France, App. p. 23 (copied from Draparnaud).

It is from specimens in the valuable collection of Mr. Jeffreys, marked " Exmouth, 1831, and Dr. Turton's cabinet," that we have drawn up our description of a shell which we have never observed as British elsewhere, and which, even as avowedly foreign, is of very rare occurrence in the cabinets of Great Britain.

Shell subrhombic, elongated, ovate, thin, inequilateral, rather compressed, especially below, where the valves meet each other at an acute angle, yet a little swollen immediately beneath the umbones. Surface with rugose concentric striulæ, covered with a rather dull epidermis of a cinereous or yellowish ash-colour, with some indistinct grey linear rays towards the margin. Hinge-margin rectilinear, but higher behind than in front, scarcely at all declining on either side. Ventral edge arcuated near the middle, ascending rather considerably in front, thus attenuating the anterior side below. Posterior side decidedly, though not so very greatly, the longer, subbiangulate, the lower corner being, however, more or less rounded off; posterior edge not much rounded. Anterior extremity much the narrower, obliquely rounded below, obtusely subangulated above. Umbones semitransparent, very little projecting, broad and blunt. Dorsal area edged with opaque white.

The largest individual measured five lines in length, and seven in breadth. The general look of the species was that of a greatly produced *caliculata*, devoid of the characteristic prominent beaks. We did not venture to open the valves, but the interior is described by Pfeiffer as having a pale bluish tinge, and Draparnaud tells us that the central teeth are not apparent, and the lateral very small. Brown's figure does not at all agree with the shell we have been describing, nor his assertion that its general contour is more orbicular than others of the genus. We have not ventured to cite either the *Tellina lacustris* of Müller, or the *Cyclas lacustris* of Nilsson, as the umbo of the former is stated to be acute, the contour of the latter to be orbicular-subrhombic.

## PISIDIUM. Pfeiffer.

Shell equivalve, thin, usually tumid, suboval, inequilateral, smooth or concentrically striated. Hinge with one tooth in the right and usually two in the left valve; also lateral teeth. Ligament external, inserted at the shorter side.

Animal suboval, with the mantles freely open in front and anteriorly, posteriorly united to form a single siphon composed of the united anal and branchial tubes; margins of its orifice and of the mantle simple. Foot large, linguiform, and very extensile.

Very small bivalves living in similar localities with *Cyclas*, and not uncommon even in drains through meadows. Like the allied genus they are ovoviviparous, and the young have more compressed shells than the adult. The British species of both *Pisidium* and *Cyclas* have been most ably investigated by the Rev. Leonard Jenyns.

* Sides not peculiarly unequal.

### P. obtusale, Pfeiffer (?).

More or less swollen, very finely striolate; umbones rather projecting and very obtuse.

Plate XXXVI. fig. 1.

*Pisidium obtusale*, C. Pfeiffer, Deutsch Land und Süssw. Moll. pt. 1, p. 125, pl. 5, f. 21, 22 (probably).—Jenyns, Trans. Cambridge Phil. Soc. vol. iv. p. 301, pl. 20, f. 1, 2, 3.—Gray, Manual L. and F. W. Shells, p. 282, pl. 12, f. 149.—Brown, Illust. Conch. G. B. p. 94, pl. 39, f. 24.

*Cyclas obtusalis* (not of Lamarck), Nilsson, Moll. Terr. et Fluv. Sueciæ, p. 101 (probably).—Hanley, Recent Shells, vol. i. p. 90, suppl. pl. 9, f. 47.

The shape of the present species, which may be distinguished from its British congeners by its more swollen valves, is rounded oval, and but slightly oblique. It is tumid, the profundity nearly equalling the breadth, glossy, and clothed with an epidermis of a greenish black or dusky ochraceous hue, margined by a zone of a dirty yellowish or somewhat orange-coloured tint, which in the young is more especially broad. Occasionally, but rarely, the entire surface, which is finely striated in a concentric direction, is of an uniform dull yellowish tinge. The sides are only moderately unequal; the ventral edge is much arcuated, and ascends the more on the shorter side. Both extremities are rounded (they are not very unequal in breadth); that of the longer side is a little more symmetrically and taperingly so. There appears to be more curvature of the hinder dorsal edge (and consequently less angularity at the upper posterior corner) than exists in *pusillum*. The umbones are tumid, obtusely rounded, and slightly prominent.

There is an elongated and swollen variety, the form of which is triangular or ovate-trigonal, with the ventral margin extremely obtuse. It is of a blackish hue, more or less stained with ochre-colour.

Mr. Jenyns, whose authority we have chiefly followed in our account of the *Pisidia*, and to whose courtesy, in the communication of specimens and information we are highly indebted, first published this species as a British animal. We confess that we have experienced much difficulty in determining the limits of this and *pusilla*, although the small ventricose examples of the former, in which the marginal zone is well developed, and the umbones are prominent, may be easily separated from larger-sized compressed typical forms of the latter, where the colouring is uniform, and the umbones not at all projecting.

Ordinary specimens do not generally exceed the ninth of an inch in length, but some are occasionally obtained measuring a line and three-quarters in length, and a line and a half in breadth.

The animal, according to Mr. Jenyns, is white. Its siphonal tube is abbreviated and more subconic. The foot is more than half the length of the shell.

"It occurs not unfrequently in Cambridgeshire, inhabiting small splashy pools and other stagnant waters," and is likewise taken in Surrey (Jenyns).

In Ireland it is by no means common, but is recorded to have been taken in Down and Tipperary; in the latter at Finnoe, in the former from a pond at Portavo, and from a drain in the clay-soil of a brick-field near Bangor. (Thomp. Ann. N. H. vi. p. 195.) K. Mancey (Mr. Barlee).

Mr. Jeffreys and Mr. Barlee procured it from Balmacarra in W. Ross; and Captain Brown, who first announced it as British, found it under the columnar greenstone rocks, at the west end of Arthur's Seat, near Edinburgh, and plentifully in a ditch (now covered up by the railway) at the Wells of Weary. Mr. Jeffreys once dredged a dead specimen of this species in forty fathoms water off Tarbet in Loch Fyne, to which extraordinary locality it had probably found its way in consequence of having been washed into the water by a stream.

From the delineation by Delessert of the Lamarckian example of *Cyclas obtusalis* we ascertain with certainty (what was previously suspected), that our own species is not precisely identical with Lamarck's, which, if any of our British shells (the description is most inadequate, and no locality is cited), is probably *pusillum*. Pfeiffer seems to indicate our typical form, and Nilsson the produced variety.

### P. PUSILLUM, Turton.

Rounded oval, not greatly inequilateral, not distinctly striated; valves not swollen, always a little compressed below: umbones usually broad and but little projecting.

Plate XXXVII. fig. 10, and (Animal) Plate O, fig. 9.

*Cyclas fontinalis*, DRAPARN. Moll. Terr. et Fluv. France, p. 130, pl. 10, f. 8—12? LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 270?—NILSSON, Moll. Succiæ, Terr. et Fluv. p. 101.—DESH. Encyc. Méth. Vers, vol. ii. pt. 2, p. 37?—HANL. Recent Shells, vol. i. p. 90, suppl. pl. 14, f. 45.—GRAS, Moll. T. et Fl. France, p. 73, pl. 6, f. 3, 4?
*Tellina pusilla*, TURT. Conch. Diction. p. 167.
*Cyclas* „ TURT. Dithyra Brit. p. 251, pl. 11, f. 16, 17; Manual of Land and Freshw. Shells, p. 16, pl. 1, f. 7.
*Cyclas gibba*, ALDER, Trans. Nat. Hist. Soc. Newcastle, vol. i. p. 41.
*Pisidium pusillum*, JENYNS, Trans. Cambridge Phil. Soc. vol. iv. p. 302, pl. 20, f. 4, 5, 6.—GRAY, Manual L. and F. W. Shells, p. 283, pl. 1, f. 7.—MACG. Moll. Aberdeens. p. 253.—BROWN, Ill. Conch. G. B. p. 95, pl. 39, f. 27.

As in most *Pisidia*, there is a considerable latitude of diversity in shape permitted to this species, which consequently, although typically orbicular-oval, becomes somewhat oblong in certain individuals. It is small, thin, semipellucid, and but slightly (for its genus) inequilateral; the valves, although not really compressed, appear so when compared with *P. obtusale*, although actually they are ventricose or nearly so. The surface is not regularly striolated, is usually concealed by a rustlike coating, and is never highly lustrous, but ranges from rather dull to rather glossy. The colouring, which is generally uniform in tint, displaying neither zones nor a marginal band, is of a light fulvous hue, and occasionally so pale as almost to become a squalid white. The ventral margin is regularly arcuated, ascending much and almost equally at both ends. The longer anterior side has its extremity tapering, and almost symmetrically rounded ; the posterior termination is broadly and very bluntly rounded, but is subangulated above from the little curvature of the very short and scarcely declining hinder dorsal edge. The ligament is scarcely perceptible ; the umbones are broad, and but little projecting.

From the valves becoming more quickly shallow (the profundity is chiefly confined to the umbonal region) than in *obtusale*, they meet below at an acute angle. There exists a variety in which the umbones are less blunt and more prominent ; and another shining one, on which the striulæ are more distinctly graven. The extreme length is a line and three-quarters, the breadth is nearly a line and a half.

The animal, according to Jenyns, is white, with a short entire margined siphonal tube, which varies its shape from cylindrical to subconic. The foot is a little longer than the length of the shell.

This is apparently by far the commonest of the smaller *Pisidia*, being a frequent and abundant inhabitant of ponds. Among other localities we may specify Scarborough (Bean); Preston (Gilbertson); Northumberland and Durham (Alder); Coggeshall, Essex (S. H.); Exmouth (Clark); near Swansea (Jeffreys); Aberdeenshire (Macgillivray); near Bantry Bay (Jeffreys) ; and, indeed, is universally distributed in Ireland, where (as in Scotland likewise) Mr. Thompson has met with it in marshy spots, adhering to the same stones as the land mollusca, and occasionally has taken it from moss only moistened by the spray of a waterfall (Ann. N. H., vol. vi. p. 195).

It inhabits Northern and Central Europe.

* * Valves very inequilateral.

### P. cinereum, Alder.

Broadly ovate, greyish or cinereous, rather compressed, finely striated ; margin of the valves meeting at rather an acute angle ; umbones obtuse, and not much produced (sometimes a little capped).

Plate XXXVI. fig. 2.

*Pisidium cinereum*, Alder, Suppl. Cat. L. and F. W. Moll. Northumb. p. 4 ; Mag. Zool. and Bot. vol. ii. p. 119.—Gray, Manual of L. and F. W. Shells, p. 286, pl. 12, f. 152.—Thomp. Ann. Nat. Hist. vol. vi. p. 196.—Brown, Ill. Conch. G. B. p. 95, pl. 39, f. 28.
*Cyclas cinerea*, Hanley, Recent Shells, vol. i. p. 90, suppl. pl. 14, f. 44.

This species, as Mr. Alder observes, is the largest of our minute *Pisidia* ; and may readily be distinguished, for the most part, from its congeners, by its more compressed shape and ashy hue. Its form is somewhat obliquely obovate, its valves are rather compressed, and its surface is covered with a shining epidermis of a greyish ash-colour, which sometimes becomes paler at the margin, and is somewhat narrowly zoned at the stages of growth with a darker tint of the same colour, and only irregularly, and occasionally somewhat indistinctly, striolate in a concentric direction. The posterior side is much the shorter and decidedly the broader ; its width is, however, a little diminished below by the greater rise of the ventral margin (which is more or less arcuated) on that side. The produced anterior side is moderately attenuated, but rounded at its extremity. The dorsal edges are short, and their declination is very trifling ; there is usually a slight angulation, especially behind, where they unite with the lateral margins. The ligament is very indistinct. The umbones are broad, obtuse, not much produced, and sometimes are slightly capped, as in *Cyclas caliculata*.

A variety exists which is rather more ventricose, and produced at the umbones.

The length is one-fifth of an inch, and the breadth nearly two lines.

It inhabits ponds, at Scarborough (Bean), in the north of England (Alder), Preston (Gilbertson), Clumber Lake in Nottinghamshire, the Croydon Canal, and at Cadley, near Swansea (Jeffreys), Bath and Exmouth (Clark).

It is widely distributed, although not common, throughout Ireland (Thompson), as in various parts of Antrim, in a moist spot in the wood at Holywood House in Down (and elsewhere in that county), at Youngrove, near Middleton in Cork (C. Wright), Killereran in Galway, Portarlington, and the vicinity of Dublin. In Scotland it has been taken at Balmacarra, West Ross (Jeffreys). The Sicilian *P. australe* of Philippi (Moll. Sicil. vol. i. p. 125, pl. 14, f. 11) is apparently identical.

### P. NITIDUM, Jenyns.

Orbicular-oval, extremely glossy, with fine striæ, and a few deeper ones upon the umbonal region : umbones rather blunt.

Plate XXXVII. fig. 14.

*Pisidium nitidum*, JENYNS, Trans. Cambridge Phil. Soc. vol. iv. p. 304, pl. 20, f. 7, 8.—GRAY, Manual of L. and F. W. Shells, p. 283, pl. 12, f. 150.—THOMP. Ann. Nat. Hist. vol. vi. p. 195.—MACGILLIV. Moll. Aberd. p. 253.—BROWN, Ill. Conch. G. B. p. 95, pl. 39, f. 26.

*Cyclas nitida*, HANLEY, Recent Shells, vol. i. p. 90, suppl. pl. 14, f. 46 (not well).

This species can with difficulty be distinguished from *pusillum* or *obtusale*, especially in the immature state, and the validity of its specific separation must rest rather upon the animal than the shell. Nevertheless, when well developed, its umbonal sulci will afford to the accurate observer a ready means of discriminating it: these, however, demand a most searching examination for their discovery. The general shape is of a rounded oval; it is slightly more convex than the preceding species and broader in proportion to it; is highly lustrous and rarely, if ever, clothed like it with a rusty or muddy coating. The general surface is only obsoletely striated at intervals, but the umbonal region is concentrically traversed with a few regular sulci, whose interstices often appear like elevated striulæ. The umbones themselves are rather obtuse, projecting but little above the dorsal line. The larger examples are an eighth of an inch in length, and not much inferior in breadth.

The animal, according to Jenyns, is white; its siphon short and funnel-shaped, with a patulous aperture, the margin of which is more or less crenated or plicated.

Mr. Jenyns obtained his original specimens from ditches in Battersea Fields, and other parts of Surrey, as well as from various spots in Cambridgeshire, where (he observes) it is widely dispersed, though seldom plentiful, and is seemingly partial to clear water. Mr. Jeffreys has obtained it from Clumber Lake in Nottinghamshire, and at Sandwich in Kent; Mr. Bean from Scarborough; Mr. A. Hancock in Northumberland, and Mr. W. Backhouse near Darlington.

In Wales it has been found at Oxwich near Swansea, and Tenby and Manorbeer in Pembrokeshire (Jeffreys).

It is generally distributed in Ireland, and abundant in a cold turfy deposit conveyed by a mountain-stream to a pond at Wolfhill, near Belfast, and on the *Utricularia vulgaris* growing in stagnant pools near that town; Lough

Gill in Sligo, Portarlington and Finnoe, in Tipperary, likewise furnish it (Thompson, Ann. N. H. 6, p. 195); Mr. Jeffreys has examples from Cork, collected by Mr. S. Wright, jun.

In Scotland it has been taken from a millpond near the new bridge of Don in Aberdeenshire (Macgillivray), where, however, it is of rare occurrence. Mr. Barlee has taken it at Bracadale and Portree, in Skye, and at other localities in the west.

### P. PULCHELLUM, Jenyns.

Small, striated (not grooved); umbones simple, and without appendage.

Plate XXXVII. fig. 12 and 13.

? *Pisidium fontinale*, PFEIFFER, Deutsch. Land und Sussw. Moll. pt. 1, p. 125, pl. 5, f. 15, 16.
*Cyclas fontinalis*, BROWN, Edinburgh Journ. of Nat. and Geograph. Science, vol. i. p. 11, pl. 1, f. 6, 7.
*Pisidium pulchellum*, JENYNS, Trans. Cambridge Phil. Soc. vol. iv. p. 306, pl. 21, f. 1, 2, 3, 4, 5. — GRAY, Manual L. and F. W. Shells, p. 284, pl. 12, f. 151.—MACGILLIV. Moll. Aberdeens. p. 252.
*Cyclas pulchella*, HANL. Recent Shells, vol. i. p. 91.
*Pisidium fontinale*, BROWN, Ill. Conch. G. B. p. 94, pl. 39, f. 23.
*Pisidium Jenynsii*, MACGILLIV. Moll. Aberdeens. p. 249.
„ *Johannis*, „ „ p. 248.

It would be a bold assertion were we to declare that form is no characteristic in the *Pisidia*; yet this species might well bear us out in the hypothesis, such a multiplicity of contour does its aspect present; with the most opposite forms, however, so gradually merging into each other that it is absolutely impossible to determine where each variety commences. Although no two forms seem more remote than typical specimens of the varieties α and δ, the former with the shape obliquely oval, the profundity of the valves not extending to the margin, and the front extremity rounded; the latter with the outline subrhomboidal oblong and devoid of obliquity, the anterior end subbiangulated, and the ventricoseness so pervading the entire shell that the lower margins almost form a rectangle at their meeting: yet intervening examples certainly do occur, knowing which we dare not subdivide *pulchellum*, as was once proposed by its author, who, in a recent communication to us, again reverts to his original opinion of the integrity of the species. One character, although varying in intensity, is common to all the varieties, viz. the presence of regular concentric striæ.

VAR. α. Rather large, obliquely oval, ventricose, rather deeply striated; the umbones rather obtuse and simple (Jenyns, pl. 21, f. 1).

VAR. β. Usually smaller and more finely striated; the umbones rather acute (Jenyns, pl. 21, f. 2, 3).

VAR. γ. Obliquely oval, finely striated, compressed; margins meeting at an acute angle.

VAR. δ. Subrhomboidal oblong, swollen almost equally throughout, deeply striated; margins meeting at more than acute angles (Jenyns, pl. 21, f. 4, 5).

For the varieties α and γ the name *Jenynsii* has been proposed by Mr. Gray, in honour of the Rev. Leonard Jenyns, who has so ably treated a genus which presented such difficulties in its investigation, that after a long and wearisome examination of its members, we have adopted throughout (although with some little hesitation) the species and varieties suggested in his valuable monograph. In our eyes the variety δ appears the least connected with the rest, and most worthy, if any, of separate specific importance. We may remark, by the by, that this form is much more likely to prove the *Tellina pusilla* of Gmelin, derived from Schröter's description and rough delineation of a Hamburg shell (Flussconch. p. 194, pl. 4, f. 7), which he terms swollen and concentrically striated, than that which we have followed Mr. Jenyns in so denominating in these pages; but in truth the synonymy of continental *Pisidia* is so doubtful, that, in default of adequately long descriptions and correctly enlarged drawings of their species, we are unwilling to originate any changes in the nomenclature of our British ones.

The animal, according to Jenyns, is white: its siphon is polymorphous, short or elongated, cylindric, truncate or obtuse at apex, with an entire or a lacerated margin, varying at various times.

The largest examples we have seen (kindly lent us by Mr. Thompson) came from Lochnaw in Wigtonshire, and measured two lines and a quarter in length, and one line and three-quarters in breadth. A line and a half by a line and a quarter are the average dimensions of the variety δ.

In Cambridgeshire it is very common in rivers, ditches, and likewise the smallest streams (Jenyns); has been found also in Northumberland (Alder), at Scarborough (Bean), Preston (Sowerby), Battersea Fields and Bookham Common (var. δ) in Surrey (Jenyns), in the ponds and ditches of Northumberland and Durham, not uncommon, (Alder), and at Cadley near Swansea (Jeffreys).

It is generally distributed in Ireland, remarks Mr. Thompson, " where it inhabits stagnant and running water of the least as well as the greatest extent, and at the same time and place may be found on various subaquatic plants and buried in the mud." The largest and finest specimens come from the gently flowing Main, near its junction with Lough Neagh (Thompson); it is found at Killarney (Barlee), Cork (S. Wright, jun.), &c. &c. Capt. Brown, who first distinguished it as a British species, states that his specimens came from a ditch at Duddingston Loch, near Edinburgh, and from another at Hunter's Bog, King's Park. Professor Macgillivray enumerates it among his Aberdeenshire Mollusca. Its foreign distribution is uncertain.

### P. HENSLOWIANUM, Sheppard.

The umbones furnished with a lamelliform projection.

Plate XXXVII. fig. 11.

*Tellina Henslowiana*, SHEPPARD, Linn. Trans. vol. xiv. p. 150.
*Cyclas appendiculata*, TURT. Manual L. and F. W. Shells, vol. xv. pl. 1, f. 6.
—HANLEY, Recent Shells, vol. i. p. 91, suppl. pl. 14, f. 42 (copied from last).
*Pisidium Henslowianum*, JENYNS, Trans. Cambridge Phil. Soc. vol. iv. p. 308, pl. 21, f. 6, 7, 8, 9.—GRAY, Manual L. and F. W. Shells, p. 285, pl. 1, f. 6.—BROWN, Ill. Conch. G. B. p. 95, pl. 39, f. 25.
*Pisidium acutum*, L. PFEIFFER, Wiegm. Archiv. f. Naturg. 1831, pt. 1, p. 230.

There is very little to distinguish this species from *pulchellum* (to which eventually it may possibly be united) except the very extraordinary appendage upon the umbones. The shape is obliquely ovate, and very inequilateral; the valves are not very ventricose (in some exotic ones they are rather compressed), and are of a horn or yellowish horn colour, and more or less closely striolate in a concentric direction. The surface seems generally more or less glossy; the ventral margin is moderately curved and rises the more behind. The produced anterior side tapers both above and below to a rounded tip, which lies usually rather below the middle; its upper edge is rather the less convex. The posterior end is of the ordinary shape in this genus,—that is to say, blunt, rounded below, and subangulated above ; the hinder margin itself is not greatly convex ; the dorsal edge is straightish and rather sloping. The chief profundity is decidedly at the umbonal region, the anterior end being manifestly compressed, and the valves being generally more or less pinched in on either side of the umbones. These last are rather acute, and are furnished with a small laminar eave-like projection, which in the adult occupies quite the summit of the shell, appearing like a ridge rising up vertically on either side of the hinge, but in the young looks like a small wing proceeding from the middle of the shell.

Specimens which measured two lines and a half in length, and two lines in breadth, are recorded by Mr. Jenyns, —dimensions far exceeding the average of our examples.

The animal, according to Jenyns, is white, with a short, generally subconic, siphonal tube.

This is a rare shell, which was first discovered by Professor Henslow in ditches communicating with the river Cam, in the immediate neighbourhood, and a few miles below Cambridge (Jenyns). It is likewise met with in Suffolk (Sheppard) ; in the Thames at Henley (Strickland), at Cadley, near Swansea (Jeffreys), and at Finnoe in Tipperary (Thomp. Ann. N. H. 6. p. 196).

It has been noticed in Germany. As a fossil, it is found in the freshwater pleistocene beds of Grays and elsewhere in the south of England.

### P. amnicum, Müller.

Not minute; extremely inequilateral, sulcately striated; umbones not very blunt.

Plate XXXVII. fig. 8, 9, and (Animal) Plate O, fig. 8.

*Tellina amnica*, Muller, Verm. Terr. et Fluv. pt. 2, p. 205. — Linn. Trans. vol. viii. p. 60.— Turt. Conch. Diction. p. 168.—Dorset Catalog. p. 31, pl. 7, f. 2, a.—Wood, General Conch. p. 153, pl. 47, f. 6.—Dillw. Recent Shells, vol. i. p. 105.—Index Testaceolog. pl. 3, Tell. f. 19.

„ *rivalis*, Maton, Linn. Trans. vol. iii. p. 44, pl. 13, f. 37, 38.—Donov. Brit. Shells, vol. ii. pl. 64, f. 2.

*Cardium amnicum*, Mont. Test. Brit. p. 86.

*Cyclas palustris*, Draparn. Moll. Ter. et Fluv. France, p. 131, pl. 10, f. 15, 16. —Gras, Moll. T. et F. de la France, p. 73, pl. 6, f. 6.

„ *obliqua*, Lam. Anim. s. Vert. (ed Desh.) vol. vi. p. 269.—Nilsson, Moll. Sueciæ, T. et Fl. p. 99.—Kickx, Moll. Brabant, p. 89.

*Pisidium obliquum*, Pfeiffer, Deutsch. Land und Sussw. Moll. pt. 1, p. 124, pl. 5, f. 19, 20.—Brown, Illust. Conch. G. B. p. 94, pl. 39, f. 22.—Philippi, Moll. Sicil. vol. ii. p. 31.

*Cyclas amnica*, Turt. Dithyra Brit. p. 250, pl. 11, f. 15.—Flem. Brit. Anim. p. 453.—Turt. Manual L. and F. W. Shells, p. 15, pl. 1, f. 5. —Hanley, Recent Shells, vol. i. p. 89, pl. 3. f. 19.

*Pisidium amnicum*, Jenyns, Trans. Cambridge Phil. Soc. vol. iv. p. 309, pl. 21, f. 2.

The outline of this species, which is by far the largest of our British *Pisidia*, is more or less obliquely subovate (often displaying a disposition to become triangular) and extremely inequilateral. The valves of the adult are moderately ventricose (in the young they are much more compressed); the profundity is chiefly manifested at the subumbonal portion, their lower part being much more shallow; they are thin, fragile, glossy, semitransparent, and generally more or less incrusted with ferruginous matter. The surface, which is concentrically traversed by rather irregularly developed sulci, whose interstices often assume the appearance of raised subimbricated striæ, is of an olivaceous ash-colour, and is broadly zoned at the margin of the larger examples with a paler or yellowish tint. It is sometimes, though rarely, observes Mr. Jenyns, of an uniform brownish or yellowish hue; sometimes, too, ashy-brown with lighter spots. The ventral margin is moderately curved behind, but arcuated and much ascending in front. The anterior side, which is much produced, is compressed and tapering at its extremity, where it is almost symmetrically rounded; the upper edge, however, is rather more sloping and slightly less convex. The hinder side is extremely short, and its termination is very blunt, the posterior edge being but little convex, and almost forming a rounded off rectangle with the basal margin; the upper corner also, from the straightness of the dorsal edge, which has a slight but distinct declination, is subangulated. The ligament is but little conspicuous; the umbones are not broad, nor much prominent. The interior is white with a bluish cast.

The dimensions of the full-grown shell are ordinarily five lines and a quarter in length, and three lines and three-quarters in breadth.

The animal is white, the siphon rather variable in shape, sometimes abbreviated, sometimes subconic; the apex is obliquely truncated, and often more or less recurved. The foot is often protruded to a great length as compared with the size of the shell.

Although not so frequent as *Cyclas cornea*, this is one of our most abundant fluviatile shells. Dr. Maton, who first defined it as a distinct member of our Fauna, obtained his specimens from the Avon, near Salisbury, and Montagu from the north Avon: it is extremely plentiful in the New River, near London (S. H.), where it partially imbeds itself in the mud, never rising (as certain other *Pisidia*) to the surface of the water; is found in the Thames at Witney, Henley, &c., as well as in the Severn (Strickland). Scarborough (Bean), the vicinity of Bristol (Jeffreys), and of Bath (Clark), the water-courses of the meadows near Wareham in Dorsetshire (Brown), &c., are among its English localities. In Wales, it has been procured by Mr. Jeffreys in the neighbourhood of Swansea and of Cardiff, at Ragland Castle in Monmouthshire, &c.

In Ireland, observes Mr. Thompson, "although not very common, it is widely distributed over the island, and is known to me as occurring in every portion except the extreme south" (Ann. N. H. vol. 6, p. 196): in the river Liffey (where it is plentiful), it attains a very large size, and is taken in the Main, near its junction with Lough Neagh (as well as in the rejectamenta of the latter), at Limerick, Miltown Malbray, Ballitore in Kildare, &c. It is found near Edinburgh, as well as in many other parts of Scotland (Brown).

It is generally distributed throughout Europe, and occurs fossil in the pleistocene freshwater beds of the Thames.

# UNIONIDÆ.

The fresh-water mussels, as the members of this family are popularly called, are very closely allied to the marine mussels, and differ chiefly in the structure of the foot of the animal which, in the tribe before us, is greatly developed in dimensions, and is not provided with a byssal groove. Mr. Anthony, an American conchologist, however, asserts that under pecaliar circumstances certain North American species do spin a byssus both in the young and adult states.* As in several of the genera of *Mytilidæ* the mantle has its margins, which cannot be reflexed, freely open almost throughout, and the siphons are only indicated by a difference in the structure of the posterior borders, the shells vary greatly in form and aspect. Those of our few native species are more or less oblong, and depressed, but so great is the variation among foreign species, that an American naturalist observes, there seems to be a representation of the forms of all the genera of marine bivalves in this tribe. All the *Unionidæ* are equivalve. They are covered with an epidermis which is often remarkable for brilliancy of colour, a feature also of the pearly surfaces of the insides of their valves.

The variation of the hinge is very great in this tribe, and its value as a source of character has been a subject of much discussion among conchologists. Some, as Mr. G.

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* Letter to J. E. Gray, in Annals Nat. Hist. vol. vi.

Sowerby, have gone so far as to propose the union of all the genera in one, whilst others, as Mr. Swainson have maintained the other extreme, and not only divided the tribe into numerous genera, but have even grouped them into sub-families. The tribe, as a group, is a very natural one; the genera are, we fear, too nearly inclined to artificial sections, and of the extreme opinions, that of Mr. Sowerby approaches nearest the truth. There are, however, in the family a few types of character, round which a number of species seem to group themselves naturally: the sections *Unio* and *Anodon* to which, with most authors, we refer our British species, are of this nature and may conveniently be retained. The value of the generic divisions at best, however, in this tribe, is not equal to that assumed by such sections in most of the other tribes we have passed in review.

The *Unionidæ* all inhabit fresh-waters. But few comparatively are found in the old world, by far the greater number being inhabitants of America. In the United States alone there are more than two hundred species. The collections made by Major Cautley and Dr. Falconer, among the Siwalik fossils would seem to indicate that during tertiary epochs the species of the old world were more numerous than they now are. The tribe ranges far back in time. All the species are very variable, and it is extremely difficult to assign their precise diagnoses.

The bisexuality of the animals of this family was first, we believe, observed by Professor Bell in Europe, and by Dr. Kirtland in America. The shells of the females are more ventricose than those of the males.

The distribution of the British fresh-water mussels is peculiar and significant of the four species we possess. Three are members of the genus *Unio* and one of *Anodon.*

The last is generally distributed through England, Scotland and Ireland; one of the *Uniones*, that representing the section *Margaritana* or *Alasmodon* is partially distributed in the three countries, confining itself to the mountainous portions, and the rapid streams which flow from them. The remaining two are confined to England, and abundant mainly in the south and east. On the continent the *Alasmodon* abounds in the Scandinavian rivers beyond the range of its fellows, which, however, have an almost universal distribution through central and southern Europe. The former species does not range south of the Alps. Taking the features of this distribution into consideration, it seems as if the *Unio margaritifera* had migrated southwards from some ancient northern centre, whilst the other *Uniones* and the *Anodonta* advanced westwards and northwards, with unequal pace, however, since only the last invaded Ireland. The fossil contents of the fresh-water tertiaries contemporaneous with or immediately preceding the period of the drift, when the greater part of the British isles was under sea, corroborate this view, for in them we find associated together the *Unio tumidus* and *pictorum* and the *Anodonta cygnea*.

## UNIO. Retzius.

Shell equivalve, often thick, inequilateral, very variable in shape (oblong in the British species) smooth, or furrowed, or nodulous on the surface, and covered with a coloured epidermis; beaks eroded. Hinge with primary teeth, and with or without elongated laterals; ligament external, more or less elongated. Muscular impressions conspicuous, pallial scar simple.

Animal shaped like the shell, thick, mantle freely open in front and anteriorly, with simple edges; branchial region fringed with numerous cirrhi, anal tube-like, plain. Foot large, broad, compressed. Labial palps ovate.

The rivers of North America swarm with species of this beautiful genus, but in Europe we have very few, and in Britain only three forms. A fourth, *Unio littoralis*, still living in France and other parts of the continent, inhabited our area during the pleiocene epoch, but has long since disappeared.

Schumacher constituted his genus *Margaritana* for those species in which the lateral tooth is not developed, and Say made his *Alasmodon* for the same section, *Unio* being retained for species with both cardinal and lateral teeth. We prefer keeping them together on account of their great similarity of habit. Lately Dr. Troschel (in Wiegmann's Archives for 1847) has attempted to found distinctions between the several genera of Naiades on the characters of the branchiæ and lips. The peculiarities he describes in his excellent paper do not appear to be more than specific.

The shells of this genus have frequently been used by painters for containing their colours, and some of the species furnish pearls. The animals are not eaten in our country, but in the south of Europe,—where everything in the shape of shell-fish is devoured with an avidity which defies starvation as long as rivers and seas yield mollusca in their present abundance—they are cooked for food, either roasted in their shells and drenched with oil, or covered with bread-crumbs and scalloped.

## U. TUMIDUS, Retzius.

Solid: umbones with confluent, concentrically disposed, angular wrinkles; anterior teeth high and conical.

Plate XL. fig. 1.

*Unio tumidus*, RETZIUS, Nova Genera Test. p. 17. — GRAY, Manual Land and F. W. Shells, p. 297, pl. 2, f. 13. — BROWN, Ill. Conch. G. B. p. 82, pl. 32, f. 5, 6, 7, 8. — SPENGL. Skriv. Natur. Selsk. Kiobenh. vol. iii. pt. 1, p. 57. — PFEIFFER, Deutsch. Land und Süssw. Moll. pt. 2, p. 34, pl. 7, f. 2, 3, and pl. 8, f. 1, 2; pt. 2, pl. 2, f. 25, (Young).—KICKX, Moll. Brabant. Austral. p. 83.— ROSSMAS. Iconog. Land und Süssw. Moll. pt. 1, p. 117, pl. 3, f. 70; pt. 2, p. 27, pl. 14, f. 202, 203, 204; pts. 7, 8, p. 41, pl. 40, f. 542; pt. 12, p. 32, pl. 60, f. 772 to 778. — HANL. Recent Shells, vol. i. p. 205, pl. 2, Mya, f. 27.

*Mya ovalis*, PULTENEY, Hutchins, Hist. Dorset, p. 27 (fide Mont.) — MONT. Test. Brit. p. 34.

„ *depressa*, DONOVAN, Brit. Shells, vol. iii. pl. 101.

„ *ovata*, DONOVAN, Brit. Shells, vol. iv. pl. 122. — MATON and RACKETT, Linn. Trans. vol. viii. p. 39. — TURT. Conch. Dict. p. 106. — WOOD, General Conch. p. 105, pl. 19, f. 5. — DILLWYN, Recent Shells, vol. i. p. 50.—Index Testaceolog. pl. 2, Mya, f. 27.

*Mysca* „ TURT. Dithyra Brit. p. 246; Manual Land and F. W. Shells, p. 21, f. 12.

„ *solida*, TURT. Dithyra Brit. p. 246, pl. 16, f. 2; Manual Land and F. W. Shells, p. 22, f. 13.

*Unio ovalis*, FLEMING, Brit. Anim. p. 416. — BROWN, Ill. Conch. G. B. p. 82, pl. 31, f. 1, 2, 3, 4.—SOWERBY, Genera Shells, Unio, f. 1.— REEVE, Conch. Systemat. vol. i. pl. 87, f. 1.

The principal difficulty in describing the *Uniones*, is to avoid laying that stress upon characters which, in most other genera, would probably be held of specific value, but here, from their extraordinary power of modifying both contour and colouring, become of minor importance. In this respect the present shell (at least in our native examples) does not vie with the succeeding: nevertheless, briefer language than usual is requisite, that the characters assigned to it may prove sufficiently broad and comprehensive. Its valves are of an elongated ovate or ovate-oblong shape, thick, unequally ventricose, (the hinder portion being always much more compressed than the frontal), and with their umbones typically more or less swollen. The external surface, which has no other sculpture than the rugose lines of increase (the umbonal wrinkles, which are subtubercular and angularly disposed, alone excepted) is more or less radiatingly painted all over, the colour of its epidermis ranging from dusky olive to a clear ochraceous yellow adorned with rays of a pure bluish green ; it is occasionally, however, of an uniform olivaceous brown. The ventral edge ascends in a well arcuated sweep anteriorly, is either straightish or curved out a little in the middle, and rising behind, often with some degree of suddenness, in a slightly convex line, forms, with the upper margin, a conical posterior beak, of which the bluntly-pointed apex (occasionally a little truncated in the young) is either subcentral or below the middle of the side. The dorsal edge, typically rather short in proportion, is nearly straight and level on both sides ; the upper posterior edge declines moderately and is straightish, or slightly subretuse. The anterior side, which occupies from one-quarter to one-third of the entire length, is unsymmetrically rounded at its extremity, the upper corner being often angulated from the comparative straightness of the dorsal line, and the ventral ascent being always more oblique than the upper declination. The ligament is rather large and projecting ; the prominent umbones are not usually broad, and have generally a well-marked impression before them. The internal nacre seems almost always of a bluish white (rarely of a salmon colour) ; the primary teeth are strong, and a little compressed, the hinder of the left valve being thick and conspicuously erect ; the lateral laminæ are produced and devoid of crenulations.

A fine specimen measured three inches in length, and rather more than half that breadth at the widest part.

The animal has plain white edges to its mantle. The branchial portion is mottled with orange brown, and fringed with numerous short cirrhi ranged in several irregular rows along the inner edges. The anal portion forms a plain edged tube-like projection, about half as wide as the former, and of a darker colour being more or less striped with purplish brown. The foot is of pale orange tint, thick and broad. Troschel observes that the lips are broader than long, and united together for half their hinder margin. The outer branchial leaflet is united to its end with the mantle; the inner one is free and not combined with the foot.

It is found in the New River, in the Avon, and Kennet, the Ouse, and several rivers in the east of England, not ranging northwards beyond the south of Yorkshire. In the Ely river, Cardiff (Jeffreys). On the continent it is chiefly plentiful in France, Belgium, and Germany.

## U. PICTORUM, Linnæus.

Posterior end not cuneiform; umbonal tubercles small, not confluent; anterior teeth compressed, elevated, sometimes crested.

Plate XXXIX. fig 1, and (Animal) plate Q. fig. 2.

LISTER, Hist. Conch. pl. 147, f. 3. — SCHRÖTER, Flussconch. pl. 4, f. 6.

*Mya pictorum*, LINNÆUS, Syst. Nat. ed. 12, p. 1112. — PENNANT, Brit. Zool. ed. 4, vol. iv. p. 79, pl. 43, f. 17. — DA COSTA, Brit. Conch. p. 228, pl. 15, upper f. 4. — MATON and RACK. Linn. Trans. vol. viii. p. 38. — Dorset Catalog. pl. 12, upper f. 4. — TURTON, Conch. Diction. p. 106.—LINN. Fauna Suecica, ed. 2, p. 516.— STURM, Deutsch. Fauna, Würmer, pt. 2. — WOOD, General Conch. p. 104, pl. 19, f. 34. — DILLWYN, Recent Shells, vol. i. p. 49.—Index Testaceolog. pl, 2, Mya, f. 26.

*Mya ovalis*, Donov. Brit. Shells, vol. iv. pl. 89.—Mont. Test. Brit. p. 34.
*Unio pictorum*, Draparnaud, Moll. Terr. et Fluv. France, pl. 11, f. 4.—Flem. Brit. Anim. p. 416. — Gray, Manual Land and F. W. Shells, p. 295, pl. 2, f. 11.—Brown, Illust. Conch. G. B. p. 81, pl. 31, f. 7, 9, 10, 11. — Lamarck, Anim. s. Vert. (ed. Desh.) vol. vi. p. 541 (partly). — Pfeiffer, Deutsch. Land und Süssw. Moll. pt. 1, p. 115, pl. 5, f. 9, 10, and pt. 2, pl. 2, f. 24 (Young).—Nilsson, Moll. Sueciæ Terr. et Fluv. p. 111. — Blainv. Man. Malacologie, pl. 67, f. 2.—Crouch, Introd. Conch. pl. 9, f. 4.—Kickx Moll. Brabant. Austral. p. 84.—Rossmasler, Icon. Land und Süssw. Moll. figs. 71, 196, 409, 587, 588, 589, 590, 741, 762, 763, 764, 765, 767, 768, 769, 780. — Hanl. Recent Shells, vol. i. p. 205, pl. 2, Mya, f. 26.
„ *rostrata*, Lamarck, Anim. s. Vert. (ed. Desh.) vol. vi. p. 540. — Brown, Ill. Conch. G. B. p. 82, pl. 32, f. 9, 10. — Pfeiffer, Deutsch. Land und Süssw. Moll. pt. 1, p. 114, pl. 5, f. 8.—Kickx, Moll. Brabant. Austral. p. 83. — Michaud, Comp. Moll. Ter. et Fluv. France, p. 108, pl. 16, f. 55. — Gras, Moll. Terr. et Fluv. France, p. 71, pl. 5, f. 21.
*Mysca pictorum*, Turton, Dithyra Brit. p. 245 ; Manual L. and F. W. Shells, p. 20, f. 11.
*Unio limosus*, Nilsson, Moll. Sueciæ Terr. et Fluv. p. 110. —Rossmas. Iconog. Land und Süssw. Moll. pt. 3, p. 24, pl. 13, f. 199.
„ *Deshaysii*, Michaud, Comp. Moll. T. et Fl. France, p. 107, pl. 16, f. 30.—Brown, Illust. Conch. G. B. p. 81, pl. 32, f. 1 to 4.—Rossmas, Iconog. Land und Süssw. Moll. pt. 3, p. 23, pl. 13, f. 197.—Gras, Moll. Ter. et Fluv. France, App.
„ *longirostris*, Ziegl. in Rossmäs. Iconog. pt. 3, p. 26, pl. 14, f. 200 and pt. 12, p. 13, pl. 54, f. 38.
Encyclop. Méthod. Vers, pl. 248, f. 4.

Although our synonymy of this well-known *Unio* may seem tolerably copious, it might without much difficulty be considerably enlarged, and embrace several other supposed species (at least we surmise so) without straining too far the elastic law of variation. As it is, we have followed the dictum of Rossmäsler, whose ample opportunities of studying and comparing the diversified and aberrant forms of the *Uniones* of an entire continent, must impart to his opinion a far higher value than our own more limited experience can pretend to. Nevertheless, we may remark as a curious fact, that we do not observe in his delineation of the Continental forms of this polymorphal shell, any of which our Islands do not exhibit a nearly analogous representative. If a certain platitude of language be demanded in a description of the preceding species, far more highly requisite is it that our diagnosis of the present one should be sufficiently inclusive.

The contour varies from a produced oval to elongated oval oblong, the texture from actually solid (it is rarely, if ever, so in our British examples) to rather thin and fragile. The valves are ventricose, but the profundity is rather diffused, the umbonal region in place of tumidity more frequently exhibiting a sort of compression, which, carried downwards to the basal margin, usually displays itself in a greater or lesser retusion of that portion of the shell. No sculpture, unless the rugose lines of increase be regarded as such, adorns the exterior; but two radiating series of small isolated (not confluent) narrow tubercles are visible upon the umbones. The epidermis is of an olivaceous yellow (for the most part changing into green posteriorly, near the obscure umbonal fold), is generally zoned with brown at the stages of growth, and rarely, if ever, displays any distinct radiation at any other portion of its surface. The dorsal and ventral margins run almost parallel; the former is almost horizontal, and nearly upon the same level on either side of the beaks; the latter rises obliquely and arcuatedly in front, but ascends very gently, if at all, at the posterior end. Similarly the declination of the posterior margin in the more typical examples is very moderate, and the edge itself short in proportion to the hinder dorsal outline; hence the termination of the shell is never cuneiform as in *tumidus*, but the tapering portion is generally short, and the beak, whose tip is either below the middle or at most subcentral, is more or less obtusely subtruncated. The anterior side, except in being rather narrower, resembles that of the preceding species; and occupies about two-sevenths (more rarely one-third) of the entire length. The hinder margin in the more characteristic specimens is at first retuse and then convex; in others it is almost entirely rectilinear; in others again (yet seldom so) it is actually arcuated. The ligament is elongated and projecting. The umbones are not particularly prominent, and are often broad. The internal nacre is silvery-white in general, but occasionally stained with salmon colour: the primary teeth are coarsely crenated, very much compressed, and the hinder one of the left valve small or obsolete; the lateral laminæ are simple, and much produced.

A large individual measured full three inches in length, and nearly an inch and a half in breadth.

A somewhat tortuous variety is taken in the River Lea, near London, and in the northern districts of England, with the rostrum bending below the level of the incurved ventral margin, and with the hinder side either greatly produced or with its upper edge arcuated. In this form the primary teeth are apt to become rudimentary.

The animal has the front margins of its mantle plain and white. The branchial portion is of an orange-brown, mottled with lighter and darker specks. It is of greater extent than in the last species, and rather more finely fringed. In a moderate-sized specimen about two hundred and fifty cirrhi may be counted. The anal portion of the mantle is darker, and is radiatingly striped near its margin with purplish-brown. The edges are quite smooth, and approximate so as to form a pretty complete prominent tube, quite distinct from the branchial region and from the hinder angulated portion of the mantle. The foot is very large, thick, broad, slightly apiculated, and of a pale yellowish-white colour. The labial palps are ovate.

Its distribution is similar to, but rather wider than that of the last species, and has been greatly extended through the agency of canals. The Kennet, Avon, Ouse, Aire, Don, and Severn include it among their inhabitants, also the canals about London, Birmingham, and Hull. Staffordshire, in Chillington Pool (Jeffreys); Shrewsbury Canal, and near Eyton (Eyton); Scarborough (Bean). "Mr. Hogg states that it has been found in the ponds at Wynyard, on the authority of Sir W. C. Trevelyan, Bart. It has not been met with further north." (Alder).

Generally distributed throughout the less mountainous and plain parts of Europe, from Sweden to Naples.

### U. MARGARITIFERUS, Linnæus.

Solid: epidermis black; no lateral teeth.

Plate XXXVIII. as Alasmodonta margaritifera.

LISTER, Hist. Conch. pl. 149, f. 4.

*Mya margaritifera*, LINN. Syst. Nat. ed. 10, p. 671; ed. 12, p. 1112; Fauna Suecica, ed. 2, p. 516.—PENNANT, Brit. Zool. ed. 4, vol. iv. p. 80, pl. 43, f. 18. — DA COSTA, Brit. Conch. p. 225, pl. 15, f. 3.—DONOV. Brit. Shells, vol. iii. pl. 73.—MONT. Test. Brit. pp. 33, 561.—MATON and RACK. Linn. Trans. vol. viii. p. 40.—MULLER, Verm. Terr. et Fluv. p. 210. —TURT. Conch. Diction. p. 106. f. 47. — CHEMN. Conch. Cab. vol. vi. p. 15, pl. 1, f. 5. — DILLW. Recent Shells, vol. i. p. 52. — Index Testaceolog. pl. 2, Mya, f. 30.

*Die Perlenmuschel*, SCHROTER, Flüssconch. p. 168, pl. 4, f. 1.

*Unio margaritiferus*, RETZIUS, Nova Genera Test. p. 16. — TURT. Dithyra Brit. p. 242, pl. 16, f. 1; Manual L. and F. W. Shells, p. 19, pl. 2, f. 9.—FORBES, Malacol. Monensis, p. 44. — SPENGLER, Skrift. Nat. Selsk. Kiobenh. vol. iii. pt. 1, p. 52.—DRAPARN, Moll. Terr. et Fluv. France, pl. 11, f. 5.—PFEIFFER, Deutsch, Land und Süssw. Moll. pt. 1, p. 116, pl. 5, f. 11.—NILSSON, Moll. Sueciæ Terr. et Fluv. p. 103.

— Kickx, Moll. Brabant. Austral. p. 82. — Rossmäsl. Iconog. Land und Süssw. Moll. pt. 1, p. 120, pl. 4, f. 71, 72, 73, 74; pt. 2, pl. 8, f. 129. — Hanl. Recent Shells, vol. i. p. 213.

*Unio elongata*, Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 531.—Nilsson, Moll. Sueciæ Terr. et Fluv. p. 106.—Michaud, Comp. Moll. Terr. et Fluv. France, p. 113, pl. 16, f. 29.—Gras, Moll. Terr. et Fluv. France, Append. p. 22.

*Alasmodonta arcuata*, Barnes, Silliman's Journal, vol. vi. p. 277, pl. 12, f. 20.—Gould, Invert. Massach. p. 113, f. 75 (Alasmodon).

*Unio sinuata*, Pfeif. Deutsch. Land und Süssw. Moll. pt. 2, p. 33, pl. 7, f. 4.

„ *Roissyi*, Michaud, Comp. Moll. Terr. et Fluv. France, pl. 16, f. 28 (fide Rossm.)

*Alasmodon margaritiferus*, Fleming, Brit. Anim. p. 417.—Gray, Manual Land and F. W. Shells, p. 293, pl. 2, f. 9. — Thompson, Ann. Nat. Hist. vol. vi. p. 197. — Macgilliv. Moll. Aberd. p. 242. — Brown, Ill. Conch. G. B. p. 83, pl. 30*, f. 1, 2, 3, 4; pl. 31, f. 1, 2; pl. 32, f. 13, 14, 15.

*Margaritana margaritifera*, Lea, Trans. Americ. Phil. Soc. vol. vi. p. 135.

The arcuated shape, and consequent incurvation of the ventral margin, in most examples of this well-known bivalve, has induced the separation of the straighter individuals as a distinct species. Believing as we do, that the *Naiades* have been most unnecessarily subdivided and multiplied, we have felt disposed to include likewise the *U. sinuatus* of Lamarck, but have been deterred, by the high authority of Rossmäsler and Deshayes, from thus extending our synonymy.

The ordinary form is oval-oblong, or elongated kidney-shaped; the valves are thick and strong, compressed when young, moderately ventricose when adult, covered with a strong epidermis of an uniform pitchy black (which is of a lighter or yellow cast in the immature specimens) smoothly spread upon the disk, but more loosely disposed towards the margin and posteriorly; occasionally the surface is obsoletely waved with very obscure concentric plicæ. The ventral margin is either incurved, straight, or at most very slightly convex, and rises much more obliquely, and considerably in front than behind. The anterior dorsal edge is never retuse, but either arcuated or slightly convex; it runs almost parallel to the opposite outline, the attenuation and occasional blunt subrostration of the hinder termination not extending far towards the beaks. These latter are almost always eroded, displaying the olivaceous nacre of the scarcely elevated umbones. The anterior side occupies but little more than a fourth of the entire length, and is rounded at its narrowed extremity, but not symmetrically so, the declination of the upper portion of the more or less arcuated upper edge not being so oblique as the slope of the lower one; just above the teeth there is a short subretusion of the dorsal edge, but except in the young no distinct lunular impression. The basal corner of the hinder end is well rounded; the upper posterior corner is often obtusely angulated in the immature shell, but in the full-grown one no angle exists, as the posterior edge forms an almost uninterrupted curve with the elongated hinder dorsal. There is no prominent umbonal fold, but a gradually widening slight hollow runs from the umbones adjacent to the dorsal edge, indenting the margin a little at its termination. The ligament is long, but its projection is very trifling. The internal nacre, which is of a bluish-white, frequently flesh-coloured towards the centre, generally stained with irregular spots or markings of bronze or green, and usually impressed near the middle with scattered indented dots, does not extend to the margin, but leaves a greenish border beyond it. The front muscular scar is very profound; the twin teeth of the left valve are erect, strong, and subconical or pyramidal, the posterior with four or five denticles upon its front surface, the anterior narrower, entire, and more or less pointed; the single opposing tooth of the right valve is broad, erect, a little twisted, somewhat arched, and deeply grooved at its apex.

Specimens are recorded to have reached the length of five and a half inches, and the breadth of two and a half inches; the majority of individuals do not measure above four and a half inches long and scarcely two broad.

The animal of this species has a white-margined mantle and foot. Troschel describes the lips as being broader than long, and united for two-thirds of their length. The outer branchial leaflets are free posteriorly, and lie in a fold of the mantle; the inner ones are partially united with the foot.

The Pearl Mussel, as this mollusk is familiarly called, enjoys a distinguished reputation as one of the few indigenous bivalves which yield the beautiful productions whose name it bears. In ancient times Britain enjoyed some celebrity for its pearls, and they constituted one of its attractions for Julius Cæsar;* who, however, does not seem to have reaped a very rich harvest, so far as quality went, though he obtained enough in quantity to cover with them a buckler, which he dedicated to Venus Genetrix, and suspended in her temple.† The pearls used for the construction of his present were probably such as Roman ladies would have scorned to wear, although they were ostentatiously offered to the goddess of beauty, for Pliny, who narrates the circumstance, states at the same time that the pearls from Britain were small and lustreless, and not to be compared with those from the East. Tacitus, in his life of Agricola, describes the pearls of Britain as "*subfusca ac liventia*," and among ancient Christian writers they are mentioned by Origen and Bede. Pennant, and other writers who have treated of pearls, have all taken it for granted that those mentioned by the ancient authors quoted were derived from the *Unio*. This, however, is by no means clear, and Cæsar's buckler was more probably covered with pearls from *Mytilus edulis*, very much inferior in quality and size to those from the fresh-water Pearl Mussel, and agreeing better with the disparaging account of them in Pliny. Those mentioned by Camden* as occurring at the mouth of the Irt, in Cumberland, seem to have been of the same nature. The pearl-fishery at the mouth of the Conway, to which we shall have hereafter to refer, also concerns the *Mytilus* and not the *Unio*. Higher up the latter river, however, and in many rivers of all parts of the kingdom, especially in the neighbourhood of mountainous districts, the *Unio* has been at various times fished to a great extent for pearls, and, in all probability, the fame of British pearls that attracted the Roman conqueror was due to the products of the shell before us. The best account of any of these fisheries of the freshwater Pearl Mussel is contained in a curious paper in the seventeenth volume of the "Philosophical Transactions" (1693), written by Sir Robert Redding, and communicated by Dr. Martin Lister. This paper has been often referred to by subsequent writers, who, however, seem to have made use of Pennant's short notice of it only, which itself was taken from the abridgment, and not from the original. It is a remarkable paper on account of the correctness of observation displayed in the personal statements of the author, who seems to have been a person with considerable natural history powers. His description of both shell and animal is curiously correct as far as it goes. He states that they were fished in the rivers of Tyrone, Derry, Donegal, near Dundalk, near Waterford, and in Kerry. The poor people fished them in the warm months before harvest-time, when the rivers were low. They took them with their toes, or wooden tongs, or by thrusting a stick into the shells which they caught sight of among the stones as they lay in part opened, with the white foot protruded "like a tongue out of the mouth." Sir Robert saw them lying on their sides, and his informants described them as "set up in the sand like eggs in salt, with the sharp edge downwards, and the opening side turned from the torrent." One in a hundred might contain a pearl, and of about one in a hundred of the pearls was tolerably clear. There were no pearls in the young mussels. "Some gentlemen of the country made good advantage thereof, and I myself whilst there saw one pearl bought for fifty shillings that weighed thirty-six carats, and was valued at forty pounds. Everybody abounds with stories of the good pennyworths of the country, but I will add one more. A miller took out a pearl which he sold for four pounds ten shillings, to a man who sold it for ten pounds, who sold it to the late Lady Glenealy for thirty pounds, with whom I saw it in a necklace; she refused eighty pounds for it from the late Duchess of Ormond." "The pearl," Sir Robert observes, "lies in the toe, or lesser end, at the extremity of the gut, and out of the body of the fish, between the two films or skins that line the shell." He remarks that they correspond with calculi in other animals.

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* Suetonius.

† Pliny, ix. ch. xxxv.

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* Britannia; Gough's edition. Vol. iii. p. 189.

The pearls of the Conway had great fame. According to Pennant a notion prevails in Wales, "that Sir Richard Wynne of Gwydir, chamberlain to Catherine, Queen to Charles the Second, presented her majesty with a pearl from the Conway which is to this day honoured with a place in the regal crown." He says the Pearl Mussels are called by the Welsh *Cregin diluw*, or Deluge Shells, as if left there by the flood.* Mr. Wilson of Warrington, in Loudon's "Magazine of Natural History" for June, 1830, says they are taken in the upper part of the Conway, near Llanrwst, but the search is very precarious. He mentions a Scotch pearl half an inch in diameter. In Scotland, the Tay was the seat of a pearl-fishery, extending from Perth to Loch Tay. "It is said," writes Captain Brown, "that the pearls sent from thence to London, from the year 1761 to 1764, were worth ten thousand pounds sterling; and it is not uncommon at the present time to find pearls in the Teith and Tay worth from one to two pounds each." The variety *Roissyi* of this *Unio* was formerly much sought for in the river near Braddan, in the Isle of Man, on account of its pearls.

In the ninth volume of the "Philosophical Transactions" (1674) there are two letters from Hamburgh, by the learned Christophorus Sardius, concerning the origin of pearls. "The pearl-shells in Norway and elsewhere," writes this author, "do breed in sweet water. Their shells are like to those which are commonly called mussels, but they are larger. The fish in them looks like an oyster, but it produceth a great cluster of eggs like those of cra-fishes, some white, some black (which latter yet will become white, the outer black coat being taken off). These eggs, when ripe, are cast out, and being cast out they grow, and become like those that cast them. But sometimes it happens that one or two of these eggs stick fast to the sides of the matrix, and are not voided with the rest. These are fed by the oyster against her will, and they do grow, according to the length of time, into pearls of different bignesses, and imprint a mark both in the fish and the shell by the situation, conforming to the figure." The editor of the

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* Brit. Zool. iv. p. 80.

"Transactions" very properly wrote to Mr. Sardius for proof of his assertion, and was informed, in reply, that it depended on a certain Dane, named Henricus Arnoldt. This account of the origin of pearls is on a par with the old poetical fancy of their origin from drops of dew. We need scarcely remind our readers that they are of the same nature with the inner coats of the shell, and are abnormal secretions of the mantle, composed of alternating and concentric layers of membrane and calcareous matter.

The Pearl Mussel is an inhabitant of rapid streams flowing from mountainous districts. Cumberland, Westmoreland, and Northumberland, in the north of England,—the streams of the hilly parts of Devon and Cornwall in the south,—many of the rivers of Wales, both north and south, —the streams of the Isle of Man,—the rivers flowing from the Highlands of Scotland, and many Irish rivers,—are its chief localities. Abroad it is found abundantly in Norway and Sweden; sparingly in mountainous districts of France and Germany.

Considerable difficulty has arisen from a statement by the late Dr. Solander, the pupil of Linnæus, that the *Mya pictorum* of the British Islands was not the species so designated by Linnæus; a declaration either resulting from his having only seen the much commoner *U. tumidus* (at that time confused with it by the English conchologists), or from his knowledge of the Linnæan types, a considerable portion of which (yet not those agreeing with the synonymy) is certainly of a form which we have not observed exactly delineated among the European Uniones, but not unlike the shell figured as *M. pictorum* by Donovan (vol. v. pl. 174), only broader in proportion to the length. Montagu having fancied he recognized the Solandrian ideal in certain shells taken in the river Kennet, above Newbury, and Wood having cited these two English writers for his *Mya Batava*, (General Conch. p. 103, pl. 19, f. 1, 2, drawn from a worn Dutch specimen,) the *Unio Batavus* (a very different-looking shell from one forwarded to us by Dr. Philippi as that of the German writers, yet probably identical), has obtained footing in our English Fauna, first appearing under that specific epithet in Dr. Turton's "Manual of the Land and Freshwater Shells of the British Islands." His figure (pl. 2, f. 10), which, as Mr. Gray justly observes, is more like a young *Alasmodonta* than any other British shell, appears to have been either copied from Wood or Schröter, —with the addition of umbonal wrinkles,—or else to be a filed down *pictorum;* it certainly is not taken from his own type (probably foreign, and added to his collection subsequently), which by the kindness of Mr. Jeffreys has been forwarded to us, and is assuredly the true *U. Batavus* of the continental conchologists, well represented in Rossmäsler's Iconographie, pl. 8, f. 128 *a*, but is much smaller, not quite measuring an inch and a quarter in length. It agrees somewhat better, except in size and colour (since it is rayed with green lines on a yellowish ground), with Turton's account in the Dithyra Britannica (p. 245), where he states his possession of it, and mentions Oxfordshire as the locality of the species; but differs completely from Montagu's description of *pictorum*, and not a little so from Donovan's figure of that shell, both which latter we are inclined to regard as only varieties of the species correctly so termed.

## ANODONTA, Brugiere.

Shell equivalve, ovate, usually rather thin, auriculated, inequilateral, closed. Beaks small. Hinge without teeth, but furnished with a lamina. Ligament external, linear. Pallial impression simple.

Animal oblong, mantle freely open, with simple margins in front and anteriorly, but fringed with numerous short cirrhi in the branchial region, plain in the anal. Foot large, broad, compressed. Labial palps large, lanceolate.

Like *Unio* this genus is chiefly American, only one distinctly-marked species inhabiting Europe. The animal is very prolific. In spring and summer the branchial leaflets of the female of our native *Anodonta* may be found charged with minute, yet complete, shelled young ones, to the number of many thousands; and Mr. Lea of Philadelphia, a naturalist who has done much towards the elucidation of the tribe, has calculated as many as six hundred thousand young *Anodontas* to be present in a single adult specimen three inches long.

### A. cygnea, Linnæus.

Plate XXXIX. fig. 3, XL. figs. 2 and 3, and XLI. and (animal) Plate Q. fig. 3.

* *Mytilus cygneus*, Linn. Syst. Nat. ed. 12, p. 1158. — Da Costa, Brit. Conch. p. 214. — Mont. Test. Brit. p. 171. — Maton and Rack. Linn. Trans. vol. viii. pl. 3 a, f. 2. — Turt. Conch. Dict. p. 115.—Schroter, Einleit. Conch. vol. iii. p. 440.—Poli, Test. Sicil. vol. ii. p. 212, pl. 33, f. 1, 2.—Sheppard, Trans. Linn. Soc. vol. xiii. pl. 5, f. 3. — Dillwyn, Recent Shells, vol. i. p. 315. — Fleming, Encyclop. Edin. vol. vii. pl. 205, f. 16.

„ *anatinus*, Linn. Syst. Nat. p. 1158. — Turt. Conch. Diction. p. 116. —

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* For additional synonyms see varieties.

SCHROTER, Flüssconch. p. 160, pl. i. f. 2, 3 ; Einleit. Conch. vol. iii. p. 442.—Index Testaceolog. pl. 12, Myt. f. 33.
*Mytilus stagnalis*, SOWERBY, Brit. Miscellany, pl. 16. — TURT. Conch. Diction. p. 115.—DILLW. Recent Shells, vol. i. p. 316.
„ *dentatus*, TURT. Conch. Diction. p. 115.
*Anodonta* (*and Anodon*) *cygnea*, DRAPARN. Moll. Terr. et Fluv. France, p. 134, pl. 11, f. 6, and pl. 12, f. 1.—TURT. Dithyra Brit. p. 239 ; Manual Land and F. W. Shells, p. 17.—FLEM. Brit. Anim. p. 415.—GRAY, Manual Land and F. W. Shells, p. 289.—THOMPSON, Ann. Nat. Hist. vol. vi. p. 197.—BROWN, Ill. Conch. G. B. p. 179, pl. 28, 28* ; 29, f. 1, 2, 3 ; pl. 30, f. 1 to 8. — LAMARCK, Anim. s. Vert. (ed. Desh.) vol. vi. p. 564. — KICKX, Moll. Brab. Austr. p. 80. — BLAINV. Manuel Malacolog. pl. 66, f. 1. — HANL. Recent Shells, vol. i. p. 216.—GRAS, Moll. T. et Fl. France, p. 70.
„ *intermedia*, LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 568.—KENYON Mag. Nat. Hist. vol. i, f. 185, at p. 428.—NILSSON, Moll. Sueciæ Terr. et Fl. p. 117.
„ *anatina*, DRAP. Moll. Terr. et Fl. France, p. 133. — TURT. Dithyra Brit. p. 240. — MACGILLIV. Moll. Aberd. p. 241. — LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 565. — NILSSON, Moll. Sueciæ Terr. et Fl. p. 114. — PHILIPPI, Moll. Sicil. vol. i. p. 67, vol. ii. p. 49.
„ *ventricosa*, KICKX, Moll. Brab. Austral. p. 80.
„ *paludosa*, TURT. Dithyra Brit. p. 240, pl. 15, f. 5.
„ *piscinalis*, NILSSON, Moll. Sueciæ Terr. et Fluv. p. 116. — ROSSMÄSL. Iconog. Land und Süssw. Moll. pt. 4, p. 23, pl. 19, f. 281 ; pt. vi. pl. 30, f. 417.
*Symphonota cygnea*, LEA, Obs. on Unio, vol. i. p. 70.

We may aptly preface our account of this ubiquitous shell, with a paragraph from Mr. Gray's excellent "Manual of the Land and Fresh-water Shells of the British Islands." It is truly, indeed, "a most variable species which appears to assume different appearances under every circumstance ; as for example, the depth, the stillness or motion, and the purity or impurity, or peculiar impregnation of the water in which it happens to be located." After a wearisome examination of a multitude of forms, both native and foreign, not only must we dissent to the division of this polymorphous bivalve into those numerous species into which it has been separated by the continental writers, but even demur to the possibility of arranging the diversities of shape and colouring into strictly defined varieties, so imperceptibly does one form glide into another, scarcely indicating by any preponderance of peculiarities, under which heading it should be ranked. Still there are certain individuals so strongly characterised, that selecting them as centres we may group around them the majority of examples, leaving, nevertheless, many specimens remaining, which, except by infinite subdivision of nomenclature, and the objectionable formation of subvarieties, cannot well be classified, but oscillate between the more marked variations. The typical form of the primitive *cygnea* (*Mytilus cygneus*, Schröter, Flüssconch. pl. 3, f. 1.—Pennant. Brit. Zool. ed. 4, vol. iv. p. 113, pl. 67, f. 78.—Donov. Brit. Shells, vol. ii. pl. 55.—Maton and Rack. Linn. Trans. vol. viii. pl. 3a. f. 2.—Index Testaceolog. pl. 12, Myt. f. 32.—*Myt. stagnalis*, Gmelin, Syst. Nat. p. 3362, from Schröter Flüssconch. pl. 1. f. 1.—*Myt. anatinus var. b.* Sturm, Deutsch. Fauna, pt. 1.—*Anodonta cygnea*, Brard, Coq. de Paris, pl. 10.—Pfeiffer, Deutsch. Land und Süssw. Moll. pt. 1, p. 111, pl. 6, f. 4, and pt. 2, pl. 6.—Rossmäs. Iconog. Land und Süssw. Moll. pt. 1, p. 111, pl. 3, f. 67, and pt. 5, pl. 25, f. 342.—Brown, Ill. Conch. G. B. pl. 28, f. 1) is oval or elongated oval, moderately and not very unevenly ventricose, and but little oblique or solid. The anterior side, which does not quite occupy one-third of the length is broadly rounded (occasionally angulated above); the posterior end is attenuatedly rounded, but not beaked, and devoid of peculiar retusion at the upper edge. From the dorsal and ventral margins running nearly parallel to each other (the latter is rather convex, the former straight or slightly swelling and not rising into a wing), the two extremities of the shell are not so unequal as in several of the other variations. The glossy epidermis is usually of a light and somewhat olivaceous yellow green, often changing into grey or ash colour upon the umbones, and adorned with two or three broad darker (often bluish-green) rays adjacent or beyond the umbonal fold. These rays, we may remark, are present in most of the varieties. The beaks and umbones are scarcely raised above the dorsal line; the former are flattened and very indistinct; the latter are channelled with small concentric folds. The nacre is silvery or occasionally of a pink or flesh-colour. The obscure pliciform wrinkles, which are indicated upon its surface, become more prominent features in *Cellensis* (*Myt. anatinus*, PENN. Brit. Zool. ed. 4, vol. iv. p. 113, pl. 68, f. 79.—MATON and RACK. Trans. Linn. Soc. vol. viii. pl. 3A. f. 1.—SHEPPARD, Trans. Linn. Soc. vol. xiii. pl. 5, f. 5.—FLEM. Encycl. Edin. vol. vii. pl. 204, f. 4.—*Myt. Zellensis*, GMELIN, Syst. Nat. p. 3362, from Schröter, Flüs-conch. pl. 2, f. 1.—*Anod. sulcata,* NILSSON. Moll. Sueciæ Terr. et Fluv. p. 113.—*Anod. cygneus*, TURT. Manual, (and GRAY) Land and Fresh W. Shells, pl. 1, f. 8.—BROWN, Ill. Conch. G. B. pl. 28 (erroneously 27), f. 1.—*Anod. Cellensis*, PFEIFFER, Deutsch. Land und Süssw. Moll. pt. 1, p. 110, pl. 6, f. 1.—ROSSMÄSSL. Iconog. Land und Süssw. Moll. pt. 4, p. 22, pl. 19, f. 280), whose contour is still more elongated, its valves more unequally and subumbonally ventricose, its hinder end more beaked, its epidermis of a greyer tint, its basal margin retuse, and its dorsal line straight or slightly concave. In *ventricosa* (*Anod. ventricosa*, PFEIFFER, Deutsch. Land und Süss. Moll. pt. 2, p. 30, pl. 3), the valves are solid and swollen, and rather more oblique than in the two preceding varieties. Its epidermis is olivaceous, its front extremity rather attenuated below; its hinder termination subrostrated:

its basal edge more frequently subretuse. The beaks seem rarely eroded in this form, but commonly so in the preceding.

When in this species the hinder contour is broad and subrhomboidal, the dorsal line manifestly rising behind, so as somewhat to alate or render winged the upper posterior corner, and the ventral edge obliquely ascending in front attenuates below the anterior extremity, whilst sweeping upward behind it rounds off the subtruncated tip of the hinder termination, the shell is usually known by the name *anatinus*, (*Grande Moule des étangs*, Geoff. Coq. Paris, pl. 3.—*Mytilus anatinus*, Da Costa, Brit. Conch. p. 215, pl. 15, f. 2.—Mont. Test. Brit. p. 171.—Chemn. Conch. Cab. vol. viii. pl. 86, f. 763.—Dillw. Recent Shells, vol. 1, p. 317.—*Anod. anatina*, Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 565.—Flem. Brit. Anim. p. 415.—Sowerby, Genera Shells.—Reeve, Conch. Systemat. vol. i. pl. 91.—Rossmäsl. Iconog. Land und Süssw. Moll. pt. 6. pl. 30, f. 417, 420.—Hanl. Recent Shells, vol. i. p. 216.—*Mytilus macula*, Sheppard, Trans. Linn. Soc. vol. xiii. p. 5, f. 6.—*Anodon cygneus var.* Brown, Ill. Conch. G. B. pl. 29, f. 1). In this variety the epidermis is generally of a clear lustrous yellowish-green, for the most part faintly radiated with darker green lines, and the umbonal folds are usually more wavy than usual. The surface, which in the adult is smooth, is rather coarsely wrinkled in the fry, where (as is the case with most *Anodons*) the elevation of the dorsal margin is pre-eminently remarkable.

The variety *rostrata* (*Anod. rostrata*, Ziegl. in Rossmäsl. Iconog. pt. 4, pl. 20, f. 284, and pt. 11, pl. 54, f. 737.—*A. cygnea*, *var. rostrata*, Brown, Ill. Conch. G. B. p. 81), is not very common, and may easily be recognized by its strongly marked characters. It is elongated, more or less compressed, rounded both above and below at the very short anterior extremity, and produced posteriorly into a long rostrum, whose subtruncated tip is generally rounded off. Its dorsal line is arcuated, and slopes downwards in front; behind it sometimes rises, sometimes falls, and the upper posterior edge is occasionally retuse, occasionally a little convex: the ventral edge is straightish or incurved. The epidermis seems almost always of a brownish or dusky olive-colour, and this is likewise the case with *Avonensis* (*Mytilus Avonensis*, Mont. Test. Brit. p. 172.—Turt. Conch. Diction. p. 116.—Index Testaceolog. pl. 12, f. 34.—*Mytilus anatinus, var. Avonensis*, Maton and Rack. Linn. Trans. vol. viii. pl. 3a. f. 4.—*Mytilus incrassatus*, Sheppard, Trans. Linn. Soc. vol. xiii. pl. 5, f. 4.—*Anodon Avonensis*, Turt. Dithyra Brit. p. 241.—*Anodon cygneus var. Avonensis*, Brown, Ill. Conch. G. B. pl. 29, f. 2), which is of a somewhat oval shape, rounded at both ends, short, and narrower in front, where the dorsal edge manifestly declines, and neither distinctly winged nor beaked behind, where the dorsal line is generally a little arched, and the upper posterior margin a little convex. The connection between this and the preceding is very close, the absence of the rostrum almost constituting the sole difference.

The limits of our work forbid the specification of the less striking variations. Dusky and solid examples, which bear some resemblance to the last in colouring, and the fall of the front dorsal edge, but are more rhomboidal and subrostrated, are usually termed *ponderosa* (*Myt. cygneus var.* Maton and Rack. Linn. Trans. vol. viii. pl. 3 a. f. 3.—Rossm. Iconog. Land und Süssw. Moll. pt. 4, pl. 20, f. 282.—*Anodonta ponderosa*, Pfeif. Deutsch. Land und Süssw. Moll. pt. 2, pl. 4.—Kickx, Moll. Brab. Austr. p. 81): the *paludosa* of Turton is beautifully radiated with light yellowish interrupted lines, on a ground of clear bluish-green, (a colouring not confined, however, to that variety,) &c.

Some of our larger examples measure six inches in length, and about three in breadth. We need not specify any peculiar localities for a species so universally diffused throughout Europe, but may observe that some of the more beautifully painted shells are obtained in the docks of London, and several of the more remarkable forms in the river Lea, near the metropolis.

The animal is shaped like the shell; the margins of the mantle are quite plain in front, fringed with two rows of short cirrhi, the outer range more closely set than the inner, at its branchial portion, plain again and projecting in tube-like fashion at its anal. The posterior part of the mantle is tawny brown, mottled, slightly edged with white anally, the frontal and anterior portions yellowish, as is also the large, broad foot. The viscera are pale. The outer lamina of the mantle, according to Tröschel, forms the mantle; the inner one is quite free from the foot. The outer one is the lodging-place of the young in spring and summer. The labial palps are broadly triangular and partially united.

This variable mollusk is generally distributed through pools, slow streams, and canals in England, Ireland, and Scotland. It is said to be a favourite food of aquatic birds. Abroad it extends its range all over Europe.

# MYTILIDÆ.

The true Mussels are mostly inhabitants of the sea, a few only dwelling in fresh water. They have more or less elongated and very inequilateral shells, always, however, equivalve. The hinge is of a very simple structure, generally devoid of teeth ; the ligament is linear. The surface of the shell is smooth, or rugose, or obliquely striated and sulcated, and is often covered by an epidermis. The animal has always two adductor muscles and a narrow strap-shaped foot, furnished with a byssal groove. It can spin a very strong and copious byssus, though, as in the case of the *Lithodomi*, this is in some species only done when it is young. The mantle has its edges variously united in some genera, and apart in others, so that some forms have distinct siphonal tubes and others none. Usually the anal tube is complete, and the branchial only rudimentary.

The structure of the shell in the *Mytilidæ* has been submitted to microscopic examination by Dr. Carpenter, with interesting results. He finds the shells of *Mytilus*, *Modiola* and *Lithodomus* all to possess a periostracum of horny membrane in which no distinct structure could be detected. Between it and the shells a thin layer of minute cells may frequently be observed. The shell itself presents two layers, distinguishable by their colour ; the internal one is often iridescent and always nacreous. Neither layer in the two former genera presents very distinct organic structure, but in *Lithodomus* the external stratum has a remarkable tubular structure, resembling that of dentine. The shell of *Dreissena* has a very different organization. In it the internal layer is composed of large prismatic cells. Between the internal white layer and the periostracum is a layer of a brownish colour, in which also traces of a cellular structure present themselves; especially in a section made perpendicularly to its surface, which brings into view a decided prismatic arrangement.* Such marked differences of minute structure in genera so very closely and unquestionably allied, leads us to infer that they afford but feeble indications of the true position or rank of a species or group in the series, though probably important as indications of the special adaptation of the creature under examination to peculiar conditions.

In the oldest fossiliferous rocks yet explored we find the remains of bivalve shells presenting striking resemblances, and indicating close affinities to the *Mytilidæ* now existing. As, however, in the latter, form of shell affords but a feeble clue to the distinctions which separate genera, it is by no means improbable that several groups of generic value, long since become extinct, may have existed in ancient epochs, though the shapes of their shelly envelopes are so very similar.

## DREISSENA. Van Beneden.

Shell equivalve, very inequilateral, sub-triangular, tumid, surface covered with an epidermis, beaks terminal, furnished internally with a transverse shelf or partition. Hinge composed of an imperfectly developed cardinal tooth in the right valve, and a corresponding socket in the left:

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* Brit. Assoc. Report. 1847.

ligament linear, internal. Three muscular impressions. Pallial impression obscure.

Animal oblong, its mantle closed except a passage for the foot and the two siphonal orifices. Branchial opening prolonged into a tube with a circular fringed orifice; anal opening plain and subsessile. Foot short, ligulate, with a conspicuous byssal groove.

This small group of *Mytilidæ* is important as constituting a link between that family and the *Unionidæ*, and like the latter inhabits fresh water. It was founded by Van Beneden in 1835, for the *Mytilus polymorphus* of Pallas, and in the "Annales des Sciences Naturelles" for that year, the Belgian naturalist has published a very excellent and detailed monograph upon it, including an anatomy of the animal, the peculiar features of which warrant a separation from *Mytilus*, not clearly indicated by the shell. As long ago as 1824, Mr J. de C. Sowerby called attention to characters, and in 1826 the arrangement of the mantle and siphons was noticed by Von Bär, in Oken's "Isis." In the same year with Van Beneden the genus *Tichogonia* was constituted for it, as a shell only however, by Rossmässler. Its claims to a generic rank were remarked by Gray in 1825. There are several species both recent and fossil. The living ones have a wide dispersion, and geologically the genus dates as far back as the epoch of the Wealden.

The fossil genera *Congeria* and *Enocephalus* appear to be identical with *Dreissena*. A number of extinct species are recorded from tertiary strata of the parent region of the species we have to describe.

## D. polymorpha, Pallas.

Plate XLII. fig. 4, 5, and (Animal) plate Q, fig. 4.

*Mytilus polymorphus*, Pallas, It. Russ. vol. i. p. 478.—Schröter, Einleit. Conch. vol. iii. p. 471.—Gmelin, Syst. Nat. p. 3363.—J. Sowerby, Trans. Linn. Soc. vol. xiv. p. 585; Zoolog. Journ. vol. i. p. 584.—Ferussac, Bull. Sciences Nat. 1826, p. 142.—Index Testaceolog. Suppl. pl. 2, Mytilus, f. 6.—Sowerby, Genera of Shells, Mytilus, f. 4.—Deshayes, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 50.—Reeve, Conch. Systemat. vol. i. pl. 102, f. 4.—Hanl. Recent Shells, vol. i. p. 250, Suppl. pl. 2, Myt. f. 6.

*Mytilus e fluvio Volgæ*, Chemn. Conch. Cab. vol. xi. p. 256, pl. 205, f. 2028.

„ ? *Volgensis*, Gray, Annals Philosoph. 1825, p. 139.

„ *lineatus*, Haardenburg, Commentatio de H. N. Molluscorum Belgicorum (fide de Haan, Van Beneden, &c.)

„ *Hageni*, Baer, ad instaurat. solemnium adjecta Mytili novi descriptio (Kœningsb. 1825); Oken's Isis, 1826, pt. 5, p. 525 (fide Van Beneden).

„ *Arca*, Kickx, Desc. nouv. espèce de Moule. 1834.

*Dreissena polymorpha*, Van Beneden, Annales de Sc. Nat. 1835, p. 210, pl. 8, f. 1 to 11.—Strickland, Mag. Nat. H. 1838, p. 361.—Gray, Manual L. and F. W. Shells, p. 300.—Brown, Illust. Conch. G. B. p. 76, pl. 29, f. 4 to 9.

*Tichogonia Chemnitzii*, Rossmassl. Iconog. Land and Süssw. Moll. p. 113, pl. 3, f. 69.

There is no fear of this naturalized bivalve being confounded with any other shell at present discovered in our Islands. Its peculiar painting separates it from any species to which it is the least allied in form. This painting consists of chocolate-coloured flexuous or zigzag markings, arranged in a concentric direction upon a white ground, which are chiefly displayed in the younger individuals, and towards the beaks of the elder examples, and usually become more scanty in number, and less beautifully undulating, as they approach the hinder termination, and are entirely absent, in every stage of growth, from the basal area. This portion, which, as well as the remainder of the surface, is covered with a glossy, olivaceous, ash-coloured epidermis, exhibiting a more yellow complexion upon the umbones, and in the immature specimens, is destitute of markings, and so abruptly compressed that its upper edge is distinctly angulated. Along that line the valves, which may be termed cuneiform in convexity, are extremely ventricose, but rapidly diminish above it. Generally speaking, the basal portion is flat or concave, and its outline is usually incurved, particularly near the beaks, which are extremely acute, bent down a little, almost touching, and usually decorticated. The texture is opaque and rather strong; the byssal aperture is of an elongated or lanceolate form, and the sinus for it, is usually more profound in the margin of one valve than in the other. The general shape is that of the common *mussel*, and liable to the same modification in its proportions: we have not, as yet, however, seen any individuals, which resemble the broad variety of that shell, and the basal part of the hinder extremity seems always the most projecting, since typically the upper or posterior edge sweeps to the base in one arcuated and much declining curve. The cardinal edge is short, occupying only one-fifth of the outline. The interior, which is of a milk or porcelain white, and not distinctly iridescent, often displays the external markings: the lamina, which connects the two sides of the shell at the beaks is rather deep set, smooth on the surface, and rather strong: there seems an obscure apical elevation of the margin in the right valve, and a corresponding sinus in the left.

Individuals whose length is an inch and three-quarters, and whose breadth is one inch, may be regarded as remarkably fine. The epidermis is often much wrinkled behind;

and the coloured markings would appear from Captain Brown's figures to be occasionally obsolete. That gentleman observes, that the scars in his specimens were of a purple hue; this, however, is not the case in our examples.

The animal has the mantle closed in front, except a small opening, from whence the short ligulate, or subcylindrical foot can be protruded, when it desires to fix its byssus. This portion of the mantle is white, and the margins of the orifice are simple. At the posterior or wide extremity, the mantle becomes of a yellowish or fawn colour, striped in a zebra-like manner with dark brown or purple; it is there prolonged into a cylindrical tube, with a circular orifice, which is bordered and internally fringed by short rather stout pointed cirrhi. Above this dorsally, at a little distance, is the slightly projecting and much smaller anal orifice, similarly coloured, but not fringed. The animal pouts out both orifices freely in confinement. The foot is white, except its byssiferous grooved portion, which is of a pale yellow colour. The lips are rather large, triangular, and lanceolate.

These mussels live gregarious, often attached in great numbers to each other, in fresh and brackish waters. Originally, apparently, inhabitants of the rivers around the Black Sea, they have gradually extended their range all over Europe; capable of enduring salt-water for a time, they have, probably, been carried across seas on the bottoms of ships, and in this manner have reached England and become so common in our canals, as to be much more abundant than many of our indigenous mollusks. Its history, as a British species, dates from 1824, when Mr. J. de Carle Sowerby exhibited it to the Linnean Society, stating that it was found "in abundance, attached to shells and timber, in the Commercial Docks, by James Bryant, Esq., who used the animal as bait for perch." Mr. Stark found it in the Union Canal, near Edinburgh, in 1834, and the Rev. M. J. Berkeley observed it in the Nen, in 1836. In the latter case, the discoverer believed it had been introduced from Wisbeach on timber, in 1828. Thus, it would appear to have found its way into Britain, at several points, and is now common in the canals of the Midland and Northern counties.

On the Continent it is found in the Wolga, Danube, Elbe, and many of the rivers of Germany and Belgium. It occurs in both the Caspian and Black Seas, and fossil in Transylvania. It is, probably, a species of ancient origin, and one of the members of the old Aralo-Caspian fauna.

## MYTILUS. Linnæus.

Shell equivalve, very inequilateral, subtriangular, more or less tumid, surface covered with an epidermis; beaks terminal. Hinge without true teeth, though often more or less denticulated; ligament linear internal; two unequal muscular impressions, pallial impression obscure, simple.

Animal oblong, its mantle freely open in the branchial and ventral region; ventral margin simple, branchial furnished with pinnated fringes; anal opening plain and sessile; adductor muscles unequal; foot narrow, ligulate, furnished with a byssal groove.

This genus and the next come so near each other, that many malacologists of repute have given up the idea of drawing a line between them. Until, however, we find that the very important difference between them in the construction of the branchial region of the mantle be proved a specific and not a generic distinction, we feel bound to retain both *Mytilus* and *Modiola*. As a general rule, the species of the former genus are littoral, those of the latter inhabitants of moderately deep water. *Mytili* are found in all seas, and range, though obscurely, far back in time.

In all countries the species of this genus are sought after for food, and accounted among the most savoury of shell-fish. They are eaten either raw, boiled or roasted. Every now and then some unfortunate Mytilophagist is first, and the newspaper-reading public afterwards, thrown into convulsions through some deleterious quality which neither boiling nor roasting can dissipate. The person affected is said to be *musseled*, and exhibits all the symptoms of poisoning. Chemistry and anatomy have alike failed in detecting a cause; and neither the season of the year, nor the mode of cooking, nor the freshness or staleness of the shell-fish,—to all which supposed causes the symptoms have been attributed—prove on close inquiry to have any connection with the results. The subject has been investigated by Dr. Burrows,* who states that commonly "the local effects have been trifling, and the prominent symptoms have been almost entirely indirect, and chiefly nervous." Sometimes an eruptive disease, resembling nettle-rash, and accompanied with violent asthma comes on; sometimes a comatose or paralytic disorder, numbness about the mouth, gradually extending to the arms, with great debility of the limbs, difficulty of swallowing and speaking. Fatal cases have generally exhibited epileptic symptoms or delirium, convulsions, and coma. Emetics rapid in their action, have been of use in treatment; æther relieves the difficulty of breathing and the other nervous symptoms, and Epsom salts, acidulated with dilute sulphuric acid, in small and frequent doses, removes the nettle-rash.

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* London Medical Repository, vol. iii. p. 445.

### M. EDULIS, Linnæus.

Plate XLVIII. fig. 1 to 4, and (Animal) plate Q. fig. 5.

LISTER, Anim. Angl. pl. 4, f. 8.—Regenfuss, Choix Coquil. pl. 4, f. 47; pl. 7, f. 8; pl. 11, f. 58.—KNORR, Délices des Yeux, pt. 3, pl. 15, f. 2.

*Mytilus edulis*, LINN. Syst. Nat. ed. 12, p. 1157; Fauna Suecica, ed. 2, p. 521. PENNANT, Brit. Zool. ed. 4, p. 110, pl. 63, f. 73.—PULTENEY, Hutchins' Hist. Dorset, p. 38.—DONOVAN, Brit. Shells. vol. iv. pl. 121, f. 1.—MONT. Test. Brit. p. 159.—MAT. and RACK. Linn. Trans. vol. viii. p. 105.—RACKETT, Dorset Catalog. p. 39, pl. 12, f. 5, left hand.—TURT. Conch. Diction. p. 109; Dithyra Brit. p. 196.—FLEM. Brit. Anim. p. 411.—MACGILLIV. Moll. Aberd. p. 234.—Brit. Marine Conch. p. 109.—BROWN, Illust. Conch. G. B. p. 76, pl. 27, f. 11 to 15, and pl. 45, f. 4, 5, 6, 7.—ALDER, Cat. Moll. Northumb. and Durh. p. 80.—FABRIC. Fauna Groenland. p. 417.—BORN. Mus. Cæs. Vind. p. 126.—CHEMN. Conch. Cab. vol. viii. p. 755, pl. 84, f. 750, 751, 755.—POLI, Test. Sicil. vol. i. pl. 1, f. 13, and vol. ii. p. 194, pl. 31 (except f. 1).—BURROWS, Elem. Conch. pl. 10, f. 5, DILLW. Recent Shells, vol. i. p. 309.—LAMARCK, Anim. s. Vert, (ed. Desh.) vol. vii. p. 47.—GOULD, Invert. Massach. p. p. 121, f. 82.—Penny Cyclop. vol. xvi. p. 46, f. a. b. and p. 47, fig. a. b. c. (well).—HANL. Recent Shells, vol. i. p. 250, pl. 12, f. 22, 48, and Suppl. pl. 2, Mytil. f. 2.—PHILIPPI, Moll. Sicil. vol. ii. p. 53.

„ *ungulatus*,* LINN. (not GMEL. nor LAM.) Syst, Nat. ed. 10, p. 705; ed. 12, p. 1156 (partly).—DONOV. Brit. Shells, vol. iv. pl. 128, f. 2.—TURT. Dithyra Brit. p. 195.

*Common mussel*, DA COSTA, Elements Conch. pl. 6, f. 3.

*Mytilus pellucidus*, PENN. Brit. Zool. ed. 4, vol. iv. p. 112, pl. 63, f. 75.—DONOV. Brit. Shells, vol. iii. pl. 81.—MONT. Test. Brit. p. 160.—MAT. and RACK. Linn. Trans. vol. viii. p. 107.—LASKEY, Mem. Wern. Soc. vol. i. p. 392.—TURT. Conch. Diction. p. 110; Dithyra Brit. p. 197, pl. 15, f. 1, 2; Brit. Marine Conch. p. 110, f. 105.—DILLW. Recent Shells, vol. i. p.

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* Montagu's description of *M. ungulinus* is avowedly compiled from foreign authors, and comprises *M. achatinus*, &c.; from it, again, is borrowed the diagnosis of the *M. ungulatus* in Turton's "Conchological Dictionary" (p. 111). We have not seen a specimen quite so large as that delineated by Chemnitz, but have little doubt that his type (Conch. Cab. vol. viii. p. 176, pl. 84, f. 756) was a large variety of *edulis*.

309. — Index Testaceolog. pl. 12, f. 22. — Mawe, Conchology, pl. 16, f. 2.

*Mytilus incurvatus*, Penn. Brit. Zool. ed. 4, vol. iv. p. 111, pl. 64, f. 74.— Mont. Test. Brit. p. 160.—Mat. and Rack. Linn. Trans. vol. viii. p. 105, pl. 3, f. 7. — Laskey, Mem. Wern. Soc. vol. i. p. 391. — Turt. Conch. Diction. p. 109; Dithyra Brit. p. 197.—Index Testaceolog, pl. 12, f. 48.

„ *vulgaris*, Da Costa, Brit. Conch. p. 216, pl. 15. f. 5 (on the left).

*Perna ungulina*, Retzius, Nov. Test. Genera, p. 21.

*Mytilus flavus*, Poli, Test. Sicil. vol. ii. p. 207, pl. 32, f. 4.

„ *sagittatus*, Poli, Test. Sicil. vol. ii. p. 208, pl. 32, f. 2, 3.

„ *galloprovincialis*, Lamarck, Anim. s. Vert. (ed. Desh.) vol. vii. p. 46. — Philippi, Moll. Sicil. vol. i. p. 72, pl. 5, f. 12, 13; vol. ii. p. 53. — Hanl. Recent Shells, vol. i. p. 249.

„ *abbreviatus*, Lamarck, Anim. s. Vert. (ed. Desh.) vol. vii. p. 47. — Potiez and Mich. Galerie Douai, vol. ii. pl. 54, f. 1.

„ *retusus*, Lamarck, Anim. s. Vert. (ed. Desh.) vol. vii. p. 48.

„ *hesperianus*, Lamarck, Anim. s. Vert. (ed. Desh.) vol. vii. p. 48 (probably). — Payraud. Cat. Moll. Corse, p. 68, pl. 2, f. 5 (probably).

„ *dilatatus*, Gray, Annals Philos. 1825; Index Testaceol. Suppl. pl. 2, Mytil. f. 2.

„ *subsaxatilis*, Williamson, Mag. Nat. Hist. vol. vii. p. 353. — Couch, Cornish Fauna, pt. 2, p. 34.—Brit. Marine Conch. p. 109.

The extreme variation of contour to which this species is liable, has caused its varieties to be designated by several appellations. Certain characters, however, pervade them all, among which the absence of true teeth may be regarded as one of the most essential importance.

That which we regard as the typical form, meaning thereby the shape which is naturally assumed by a species not forced to adapt its proportions to the circumstance of its habitat, is not what we are accustomed to view it in the stalls of the fishmongers, narrow and subarcuated, but rather the dilated and triangular *subsaxatilis*, whose solitary haunts permit a freer development of its several parts, than the gregarious habits of the more frequent variety allow of. In this, then, the form is shorter and subtrigonal.

with the dorsal angulation much more marked, and the hinder termination more expanded than in the ordinary cramped variety. In the latter, the cardinal edge is short, and the posterior produced comparatively straight, and running parallel to the ventral ; in the former the hinder outline arches out more boldly both above and below, and the greater declination of the posterior edge renders the projection of the dorsal angle more apparent. This angle, which is either subcentral or lies rather before the middle of the shell, is greatly modified in the extent of its obtuseness by the greater or lesser curvature of the upper or posterior margin, and the degree of its declination. If the angle formed by the junction then of the upper and cardinal edges be a very obtuse one, the former will run nearly parallel to the basal, and instead of uniting with it in a single sweep, generally forms a second very obscure rounded-off corner, as it merges into the posterior extremity, which is usually rather broadly rounded, and more projecting below than above. The basal or front ventral margin, is by no means constant in its outline ; occasionally as in the variety *incurvatus*, it is profoundly concave, in others it is almost straight ; in some it is slightly gibbous behind, in others it swells out more towards the beaks.

There are two principal variations of colour. That which is the most common is where the shell, whose texture is strong and nearly opaque, has the exterior, beneath the olivaceous or yellowish-brown epidermis, of an uniform blackish-blue, (the colouring matter in its earlier coats is almost always arranged in darker rays upon a paler ground, and in darker and lighter zones, as may be observed where the surface is abraded); the basal portion, however, is often of a squalid white ; the interior is of a more or less dull white, margined with blue. The other, which is a far more beautiful thin and semi-transparent shell, has a brownish-yellow epidermis, beneath which the surface is either uniform white, which is very rarely the case, or adorned with a very variable number of narrow and occasionally even linear blue rays on a pale ground; the interior is of an uniform somewhat nacreous white, but never opaline.

The entire shell is devoid of sculpture; the epidermis is more or less glossy, rarely if ever either quite dull, although generally but little shining or highly polished. The compressed basal area is usually narrow, and generally terminates rather abruptly behind. The beaks are pointed, quite terminal, and diverge a little from each other. The hinge-margin is not crenulated (a ready mark of distinction from the *minimus* of Poli and Philippi, which looks like a dwarf specimen of it); there are no real teeth, but about four narrow denticles, usually concealed by the overlapping epidermis.

Ordinary sized English specimens do not much exceed two inches and a half in length, and about half that breadth. Mr. Barlee, however, has an example from Loch Fyne which measures eight inches and a half!

The *Mytilus striatus* of the English writers (Mont. Test. Brit. p. 173.—Trans. Linn. Soc. vol. viii. p. 112) solely constructed from a figure (75) in Walker's "Testacea Minuta Rariora," and surmised by Montagu to be possibly, if indeed a shell at all (which we much doubt), the fry of the large *Modiola*, is cited by Turton for the young of this species.

Animal shaped as the shell, thick, the margins of the mantle freely open in front and in the branchial region, united to form a tube only in the anal region. They are quite simple anteriorly near the beaks, serrated towards the middle of the front of the shell, and furnished with pinnated cirrhi in the branchial range. There are about sixteen of these pinnated fringes which are usually, in British specimens, of a yellowish white colour, though sometimes, as well as the edges of the mantle, tinged with brown, and in the foreign variety *galloprovincialis* they are often deeply tinged with purple. The anal siphon is very short, white, and equals half the breadth of the branchial range; its margins are quite plain. The foot is dusky, narrow, strap-shaped and grooved; from the basal part of the groove the animal spins its byssus, which is long, coarse, and of a yellowish brown colour. When the byssus is broken away, another set of threads is readily and often rapidly spun. The branchial leaflets are tawny, elongated, nearly equal, and free at their lower edges. The labial palps are also tawny, and of a triangular acuminate shape, smooth on their outsides, and (as first observed by Mr. Clark,) only partially pectinated on their inner surfaces.

The common mussel is much used in many places for food, and still more for bait. Dr. Knapp of Edinburgh has communicated to us a very interesting account of the quantities of this animal destroyed annually in the neighbourhood of that city. "As an article of food," he states, "there cannot be used fewer than ten bushels per week in Edinburgh and Leith, say for forty weeks in the year, in all 400 bushels annually. Each bushel of mussels when shelled and freed from all refuse, will probably contain from three to four pints of the animals, or about 900 or 1000, according to their size. Taking the latter number, there will be consumed in Edinburgh and Leith about 400,000 mussels. This is a mere trifle compared to the enormous number used as bait for all sorts of fish, especially haddocks, cod, ling, holibut, plaice, skate, whiting, &c. In Newhaven alone there are four large deep-sea fishing boats, which generally go out three times a week, and fish for about thirty weeks in the year, excluding Sundays and bad weather. Each of these large boats carries eight men, with eight lines of 800 yards in length, which, at a low calculation, take 1200 mussels to bait, each time they are used ; so that each large boat will use 28,800 mussels per week, equal to 864,000 per annum. But there are about sixteen other smaller boats, which go out daily, or rather at twelve o'clock every night for about the same number of weeks in the year. Each carries four men, with four lines 800 yards long. Their consumption of mussels will come to 3,456,000. The total consumption of mussels for bait annually in Newhaven alone may be reckoned at 4,320,000. As there are nearly as many used at Musselburgh and Fisherrow, Buckhaven, Elie, Anstruther, Pittenweem, Crail, and other places on the Frith of Forth, we may calculate that thirty or forty millions of mussels are used for bait alone by the fishermen of this district each year. Numbers come from the river Eden in Fife, and are sold at 25*s.* per cask. The best mussels at Newhaven are got directly north of the Pier, in three fathoms water, and are sold at 8*d.* per basket, each containing nearly a bushel." The beds are private property, and some of them having been injudiciously or avariciously exhausted, the number of mussels in the Forth has decreased, and the price increased with the last ten years.

Mussels are kept in many places in artificial beds, to be used when required for bait. At Anstruther, in Fifeshire, we have seen these " mussel gardens," as they are called,—little plots of sea-shore between tide-marks, edged in by stones, and held as private property. In Northumberland, Mr. Alder states, the fishermen built up piles of stones among the rocks to keep their mussels safe.

We have alluded to the pearls procured from this species when treating of the *Unio margaritiferus*.* They are commonly small, ill-coloured, and of little value, yet have been at various times much sought for. The following passage in Camden† about the pearls in Cumberland, evidently refers to these. "Higher up the little river that runs into the sea, in which the shell-fish having by a kind of irregular motion taken in the dew, which they are extremely fond of, are impregnated and produce pearls, or to use the poet's phrase, *baccæ cochleæ*, shell berries, which the inhabitants, when the tide is out, search for, and our jewellers buy of the poor for a trifle, and sell again at a very great price." A very curious account of a recent pearl fishery in North Wales is given by a correspondent in Loudon's Magazine of Natural History, for 1830. The writer has confounded the *Mytilus edulis* with the *Unio*. To the latter his remark on pearls "found up the river" only applies. We quote the letter nearly entire:—

"The pearl mussel is found in abundance in the river Conway, in North Wales, and is collected by many of the natives, who obtain their livelihood entirely by their industry in procuring the pearls. When the tide is out they go in several boats to the bar at the mouth of the river, with their sacks, and gather as many shells as they can before the return of the tide. The mussels are then put into a large kettle over a fire to be opened, and the fish taken out singly from the shells with the fingers and put into a tub, into which one of the fishers goes barefooted, and stamps upon them until they are reduced into a sort of pulp. They next pour in water to separate the fishy substance, which they call solach, from the more heavy parts, consisting of sand, small pebbles, and the pearls which settle at the bottom. After numerous washings, until the fishy part is entirely removed, the sediment, if I may so term it, is put out to dry, and each pearl separated on a large wooden platter, one at a time with a feather; and when a sufficient quantity is obtained, they are taken to the overseer, who pays the fisher so much an ounce for them. The price varies from 1*s.* 6*d.* to 4*s.*; there are a number of persons who live by this alone, and where there is a small family to gather the shells and pick out the fish, it is preferable to any other daily labour. The pearls are generally a dirty white, sometimes blue, but never I believe green or reddish. I cannot with accuracy say how many ounces are taken to the overseer each week, though I might say there are some scores. But what makes this fishery the more singular is the mystery which hangs over it. At present it is a perfect monopoly, and there is but the one who buys them up that knows what becomes of them afterwards. It has been carried on in this manner for many years, and as such a thing, if made public, might prove more beneficial to the neighbouring poor, by causing a higher price to be given for the pearls, it would be more so, if any of your numerous correspondents could throw some light on this interesting subject. There have been some curious and fanciful surmises, which may not be thought worth mentioning. Some suppose that the pearls are sent abroad to be manufactured into seed pearls; others more gravely, that they are exported to India to be dissolved in the sherbet of the nabobs! However, at present it is a mystery; and, notwithstanding the pains taken and the expense incurred by some liberal gentlemen in endeavouring to find out the secret, it is as great a mystery as ever. The huts which have been erected for the convenience of boiling the fish, are on the extremity of the marsh, about a mile north of the town of Conway. The pearls are seldom found here much larger than the enclosed specimens, though about twelve miles up the river, they have been found occasionally as large as a moderate-sized pea, and have been sold for a guinea the couple, but they are very rarely met with. When I say that the price varies from 1*s*. 6*d*. to 4*s*. I do not mean to say that they are valued according to their size, for the large and small pearls are all sold together; but some years ago they were as high as 4*s*., now they are only 2*s*. per ounce."

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* Since our account of that shell was printed, Dr. Knapp has communicated information respecting the pearls found in it in Scotland. He says, "they are now rare, the price of fine pearls of good lustre and water varying from two shillings to ten or twelve pounds, according to size. Round pearls, perfect in every respect, about the size of a pea, are worth three or four pounds."

† Camden's Britannia, Gough's edition, vol. iii. p. 189.

There is no occasion to enumerate localities for so common a shell as the *Mytilus edulis*, universally distributed around our coasts, and plentiful in favourable localities near the edge of low water, and in a fathom or two beyond. The variety *pellucidus* ranges deeper.

The species ranges all round the coasts of the North Atlantic, on both its eastern and western sides, and into the Mediterranean. It is found fossil in the red and mammaliferous crags, and everywhere in pleistocene deposits.

## SPURIOUS.

### M. bidens, Linnæus.

Lister, Hist. Conch. pl. 366, f. 206.
*Mytilus bidens*, Linnæus (not Born nor Dillwyn), Syst. Nat. ed. 12, p. 115. —Deshayes, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 39.
„ *striatulus*, Schröter, Einleit. Conchylien, vol. iii. p. 449, pl. 9, f. 16.—Turton, Magaz. Nat. Hist. vol. vii. p. 350.—Brit. Marine Conch. p. 110.—Index Testaceolog. pl. 12, f. 19.

*Perna striatula*, Retzius, Nov. Gen. Testac. p. 21.
*Mytilus exustus*, (not Born, Gmelin, Dillwyn), Lamarck, Anim. s. Vert. (ed. Desh.) vol. vii. p. 39. — Brit. Marine Conch. f. 22.— Deshayes, Encyclop. Méthod. Vers. (Supplement), vol. ii. p, 559.—Hanley, Recent Shells, vol. i. p. 244.
Encyclopédie Méthod. Vers. pl. 220, f. 2 (?), 3, 4.

Dr. Turton has introduced this W. Indian mussel among our British bivalves, on account of Mr. Bean having taken it alive from some floating timber at Scarborough. That gentleman, however (to whom we are indebted for specimens), confesses, with his usual frankness, that he has only obtained it under circumstances which leave no doubt upon his mind of its exotic origin. Our synonymy demands a few explanatory remarks. One of the results of our long and studious examination of the Linnean cabinet is the confirmation of M. Deshayes' conjecture of the identity of the *Mytilus exustus* of Lamarck with the lost *bidens* of Linnæus. The language and drawing of Schroeter leave little doubt that the *striatulus* of his work is the same species, but the original shell so named in the "Mantissa" of Linnæus, (p. 548. —Dillw. Recent Shells, vol. i. p. 308.) stated to be grey, pellucid, most delicately striated, and from the Northern Ocean, will not so exactly agree as is fitting for its identification. We have received from the United States of N. America examples of this bivalve (whose range of variation is so extensive, that we have thought it advisable, for its full recognition, to aid our references by a short description), as the *M. cubitus* of Say, but that author's language (Journ. Acad. Nat. Scien. Philadelphia, vol. ii. pt. ii. p. 263.) seems, at least, equally applicable to *Modiola sulcata*, a representation of which in Lister (pl. 365), he remarks, it agrees very well with, and repudiates the figures of the Lamarckian *exustus*, in the "Encyclopédie Méthodique." Our recollection of the types of the *M. ustulatus* of Lamarck (as usual, inadequately characterized), tends to the supposition that they were not specifically distinct; but we will not venture to offer any positive assertion to that effect. The *Mytili* demand a close inspection of the growth-line, as indicative of the natural contour, being all of them individually affected as to the incurvation or gibbosity of the front ventral margin, the extent of dorsal angulation, and even the arcuation or retusion of the posterior outline, by the freedom or crampedness of their dwelling-places.

The shell is covered with a thin brownish yellow or scorched looking epidermis (with a lustre more or less resinous), beneath which the surface is concentrically painted with more or less interrupted bands of a sombre violet or dusky liver-colour on a paler ground. These markings are occasionally obsolete, and sometimes partially transmuted into flexuous radiating streaks. The interior is rich purple, or pearly white with purple stains. The exterior is sculptured with most numerous radiating striæ, which are elevated, subcrenated, slightly divergent, and of nearly equal strength throughout, except that they attenuate a little in front, and usually become obsolete near the byssal aperture. The interstices are about the width of the costellar striæ, and are restrained from dilating by the continual bifurcation of the latter. The beaks are not perfectly terminal. The hinge has one or two small teeth in each valve. The margin is crenated, except near the byssal gape.

The general shape is very irregular; typically it is subtriangular, with the dorsal edge straightish, much elevated, and nearly equal in length to the distance to the hinder extremity, the subcentral dorsal angulation being well marked; occasionally it is crescent-shaped, the dorsal edge being curved and uniting to the posterior margin without angulation. The convexity is usually moderate; when the valves have free scope for dilation, then trifling; when they are contracted and narrow, then considerable.

### M. CRENATUS, Lamarck.

*Mytilus crenatus*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 39. — WILLCOX, Zool. Journ. vol. i. p. 590; Report Brit. Assoc. vol. iii. — BROWN, Illust. Conch. G. B. p. 77, pl. 23, f. 1, 2. — SOWERBY, Genera Shells, Mytilus, f. 3. — REEVE, Conch. Iconica, pl. 102, f. 3.—HANLEY, Recent Shells, vol. i. p. 244.
Encyclopédie Méthodique, Vers. pl. 217, f. 3.

*An inhabitant of New Zealand, &c.; introduced by Mr. C. Willcox as naturalized at Portsmouth, having originally come over attached to the "Wellesley" from Bombay, and thence spread to various parts of the harbour. We know of no good description of this species (which is most closely allied to* Magellanicus), *but the* *plate in Sowerby's "Genera," (used, likewise, for Reeves' "Conchologia Systematica,") very characteristically represents the shell which was kindly forwarded to us for examination by Mr. Willcox.*

### M. AFRICANUS, Chemnitz.

KNORR, Délices des Yeux, pt. 6. pl. 4, f. 1.
*Mytilus Africanus*, CHEMNITZ, Conch. Cab. vol. viii. p. 160, pl. 83, f. 739, 740, 741.
„ *Afer*, GMELIN, Syst. Naturæ, p. 3358.—LAMARCK, Anim. s. Vert. (ed. Desh.) vol. vii. p. 44.—HANLEY, Recent Shells, vol. i. p. 248.
„ *ungulatus, junior*, DILLWYN, Recent Shells, vol. i. p. 310.—TURT. Conch. Dict. p. 111.—FLEMING, Brit. Anim. p. 411.
*Moule d'Afrique*, BLAINVILLE, Man. Malacol. pl. 64, f. 2.
Encyclopéd. Méthodique, Vers, pl. 218, f. 1.

*Introduced by Dr. Fleming under the name of* M. ungulatus, *but only as a straggler, adhering to the bottom of vessels from the African coast.*

## MODIOLA. LAMARCK.

Shell oblong, equivalve, inequilateral, valves smooth, or sulcated concentrically, invested with an epidermis, which is usually filamentose, especially in young specimens. Anterior side very short, beaks rarely quite terminal. Hinge margin toothless, or with only a compressed tooth-like callus, and rarely corrugated; ligament linear. Muscular scars very unequal, pallial impression obscure.

Animal oblong, margins of mantle in all parts simple, closed only to form a short, and more or less perfect tube in the anal region. Foot cylindrical, with a more or less cylindrical byssal gland at its base. Branchiæ elongate. Labial palps triangular and pointed.

It is very difficult to draw a line between the shells of this genus and those of *Mytilus*, and were it not for the peculiar simple character of the branchial region, the mantle contrasting strongly with the fringed and pinnated features of the same part in the latter group, we should feel inclined to unite them, as many malacologists of eminence have done. The *Modiolæ* are often handsome shells, and of tolerably ample dimensions. They spin a strong byssus, and several of the species can construct a sort of enveloping nest from it. They live sometimes singly, sometimes gregariously, in various depths of water, and are sought after for bait by fishermen, though usually rejected, on account of their too strong scent and flavour, as food. The genus dates very far back in time, many palæozoic shells appearing to belong to it.

## M. Modiolus, Linnæus.

Large, not rayed with crimson; epidermis lustrous, its filaments entire at the margins; dorsal edge quite equal to the upper posterior one; beaks not quite terminal.

Plate XLIV. fig. 1, 2.

*Mytilus Modiolus*, Linn. Syst. Nat. ed. 12, p. 1158.—Penn. Brit. Zool. ed. 4, vol. iv. p. 113, pl. 66, f. 77.—Da Costa, Brit. Conch. p. 219, pl. 15, f. 5 (on the right).—Pulteney, Hutchins, Hist. Dorset, p. 38.—Donov. Brit. Shells, vol. i. pl. 23.—Mont. Test. Brit. p. 163.—Maton and Rack. Trans. Linn. Soc. vol. viii. p. 107.—Dorset Catalog. p. 40.—Laskey, Mem. Werner. Soc. vol. i. p. 392.—Chemn. Conch. Cab. vol. viii. p. 178 (but not his Tranquebar shell, pl. 85, f. 757).—Müller, Zool. Danic. pl. 53.—Dillw. Recent Shells, vol. i. p. 314.—Index Testaceolog. pl. 12, f. 31.—Fleming, Encyclop. Edin. vol. vii. pl. 203, f. 22.

„ *umbilicatus*, Penn. Brit. Zool. ed. 4, vol. iv. p. 112, pl. 65, f. 76.—Donov. Brit. Shells, vol. ii. pl. 40.—Mont. Test. Brit. p. 164, and Suppl. p. 71.—Maton and Rack. Trans. Linn. vol. viii. p. 109.—Index Testaceolog. pl. 12, f. 49.

„ *curtus*, Penn. Brit. Zool. ed. 4, vol. iv. p. 112, pl. 64, f. 76 a.

„ *curvirostratus*, Da Costa, Brit. Conch. p. 220.

„ *barbatus*, Pulteney (not Linn.), Hutchins, Hist. Dorset. p. 38.—Donov. Brit. Shells. vol. ii. pl. 70.—Mont. Test. Brit. p.

161.—Maton and Rack. Dorset. Catalog. p. 40, pl. 12, f. 5 (on the right).

*Modiola Papuana*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 18 (partly). — Brown, Illust. Conch. G. B. p. 77 (chiefly), pl. 27, f. 1 to 4. — Leach, Zoolog. Miscellany, vol. ii. p. 33. — Say, American Conchology, pl. 45. — Blainville, Manuel Malacologie, pl. 64, f. 3 (probably).

„ *Modiolus*, Turt. Dithyra Brit. p. 199, pl. 15, f. 3. — Brit. Mar. Conch. p. 107. — Gould, Invert. Massach. p. 123. — Hanl. Recent Shells, vol. i. p. 233, pl. 12, f. 31, 49.

„ *vulgaris*, Fleming, Brit. Anim. p. 412. — Alder, Catal. Northumb. and Durham Moll. p. 81. —Woodarch, Conchology, ed. 2, pl. 1, f. 10.

*Mytilus Papuanus*, Deshayes, Encyclopédie Méthod. Vers, vol. ii. p. 564, pl. 219, f. 1.

*Modiola barbata*, Macgilliv. Moll. Aberdeenshire, p. 237.

This fine *Modiola*, which surpasses in amplitude any known species of its genus, bears but little resemblance, when adult, to most of its European congeners, but approximates rather to certain of the species *(Philippinarum, Australis, &c.)*, inhabiting the Chinese and Australian seas. Its shape is oblong-subtrigonal, or elongated-oblong, and excessively inequilateral ; its valves, when fully grown, are strong, opaque, and covered with a pitch-brown cuticle, or stout adherent epidermis, which is coarsely wrinkled in a concentric direction, slightly glossy, and destitute of all painting or variation of tint upon its surface. The younger shells have their cuticle of a deep yellow, or fulvous cast, changing into chestnut in front and towards the hinder dorsal area : intermediate gradations are of an uniform fawn colour. The profundity of the valves varies greatly, as is usual in the genus, at different portions ; the central area, or that which runs diagonally from the beaks to the hinder termination of the shell, is rather broadly elevated (not carinated) near the umbones, but greatly diminishes in convexity below. This elevation is preceded by a broad, but very shallow, groove-like space, before which, the surface again swells out a little, and then diminishes again in front. The chief compression is, of course, at the juncture of the hinder dorsal edge with the posterior margin, which latter being always more or less produced, the dorsal wing, which is more or less subangular (the angle being occasionally also rounded off), consequently lies just midway between the umbones and the rather broad and well rounded termination of the hinder side. The cartilage margin, which is not bordered by any dull strip of epidermis, as in *Metcalfei*, is nearly rectilinear, but with a tendency to convexity, and rises with an ascent sufficient to prevent the upper and lower edges being at all parallel; the upper posterior outline varies from somewhat arcuated to rectilinear, and is never incurved or decidedly retuse. Owing to the all but terminal position of the beaks, the anterior side is almost rudimentary; it is very narrow, but not attenuated below, as in certain *Modiolæ*, by any peculiarly oblique rise of the ventral margin, but is rounded and about equally projecting above and below: the front dorsal edge is not on the same plane with the hinder one, but decidedly below its level. The filaments of the epidermidal beard, which is chiefly apparent upon the younger shells, are very slender, greatly produced, and not serrated on either edge. The interior of the shell is whitish, but often slightly tinged with lilac, a deep stain of which is generally visible externally on removing the cuticle; the hinge-margin does not exhibit any teeth or crenulation, but is thickened at the beaks.

The largest individuals usually come from the North, and average about five inches in length, and rather more than two in breadth: a specimen, measuring seven inches in length, and three inches and a quarter in breadth, is recorded by Captain Brown to have been caught by a fisherman's line, near the Bell Rock, on the coast of Forfarshire.

The animal is oblong, soft, and of a mingled dusky and bright-red and orange colour, more or less speckled with yellowish-white. The mantle, except its edges, is pale and whitish. The base of the foot, and its large and conspicuous byssiferous gland, which appears as if a distinct organ, are wrinkled and cylindric; the finger-shaped portion of the foot is subconical, smooth and red, and small in proportion to the size of the body. The branchial laminæ are tawny. The posterior adductor muscle is conspicuously larger than the anterior. The byssus is strong, and of a more or less shiny yellowish hue: the extremities of the threads are fixed by a small expansion to neighbouring bodies, and being usually arranged in several linear series, cause, when they are broken away, the appearance of rows of zoophytic cells, or peculiar *nidi*.

The Horse Mussel, as this fine species is popularly called, is so universally distributed around our coast, that to quote localities would be superfluous. We have met with it in all depths of water between low-water mark and sixty fathoms. It is small at great depths, finest in from seven to thirty fathoms, and frequents gravelly and muddy localities most. In tide-ways it sometimes envelops itself by means of its byssus, in a complete nest or investment of threads and gravel: this habit we have observed in thirty fathoms water, seven miles north of Anglesea (M'Andrew and E. F.). At Rothesay, Mr. Alder informs us, it is common just below low-water mark, and is waded for by women and children at low tides for food.

It ranges through the North Atlantic; but seems to have had its origin on the European side, where it is found fossil in the mammaliferous crag.

### M. PHASEOLINA, Philippi.

Small, never rayed ; epidermis highly polished, its byssal filaments simple ; dorsal edge much shorter than the upper posterior one ; hinge-margin with most minute internal corrugations ; beaks terminal.

Plate XLIV. fig. 3.

*Modiola phaseolina*, PHILIPPI, Mol. Sicil. vol. ii. p. 51, pl. 15, f. 14.—JEFFREYS, Ann. Nat. Hist. vol. xix. p. 313.

From the simple filaments of its byssal garment, this recently discovered shell incurs more risk of being confounded with *Modiolus* than with *barbata*, although they are profusely disposed as in the latter, rather than scantily furnished as in the former. There appears to exist a considerable diversity of outline in different individuals, some more nearly exhibiting the outline of one, some of the other of the two species we have mentioned, but all seem either devoid of dorsal angulation, or else with their angle much nearer to the anterior end than in those species. The valves are subventricose; their convexity is rather evenly disposed, there being scarcely any dorsal compression, and no posterior retusion of surface. The cuticle is highly lustrous (which polish pervades its entire extent) and is of a brownish-yellow, becoming paler in front of the diagonal elevation. The hinder dorsal edge, which is straight, ascends considerably, and is shorter than the upper posterior outline ; which latter is subarcuated, and runs nearly parallel to the ventral margin, in its junction with which it forms a broad and rounded termination. The ventral margin is swollen behind ; the lower front area is very small, and does not at all project beyond the terminal beaks, so that strictly speaking there is no anterior side.

The interior does not appear in those we have examined to be very pearly, but stained behind with liver colour.

There is a well-marked rib-like callus which strengthens the hinge-margin in front just beneath the beaks, at the summit of which the hinge-margin appears when very highly magnified, to be subdenticulately corrugated as in the genus *Iridina*. There are a few minute marginal crenulations also behind the cartilage.

This interesting species, first published as British by Mr. Jeffreys, in 1847, is probably not very uncommon, and has been passed over as the young of *Modiolus*. He had observed it in the Hebrides as long ago as 1843. Since then it has been taken not unfrequently by Mr. M'Andrew on the west, and by Lieut. Thomas on the north-east coasts of Scotland. It had previously been observed in Sicily, but only in a fossil state.

### M. TULIPA, Lamarck.

Never large; always rayed with crimson or violet, smooth; byssal filaments obscure if present; posterior edges sub-retuse; beaks not quite terminal.

Plates XLV. fig. 7, XLVIII. fig. 6, and (Animal) plate Q. fig. 6.

LISTER, Hist. Conch. pl. 359, f. 198?—KNORR, Délices des Yeux, pt. 4, pl. 15, f. 3 (probably).

? *Mytilus Modiolus*, CHEMN. Conch. Cab. vol. viii. pl. 58, f. 758.

? *Modiola Americana*, LEACH, Zoolog. Miscellany, vol. ii. p. 32, pl. 72, f. 1.

" *tulipa*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 19 (partly).—SOWERBY, Genera Shells, Modiola, f. 5 (probably).—PHILIPPI, Moll. Sicil. vol. i. p. 69, and vol. ii. p. 50.—SOWERBY, Conch. Manual, f. 160?—REEVE, Conch. Systemat. vol. i. pl. 101. f. 5 (prob).

" *radiata*, Brit. Marine Conch. p. 249; f. 104.

" *Papuana*, *young*, BROWN, Illust. Conch. G. B. p. 77, pl. 27, f. 5, 6.

It is not improbable that formerly this elegant little shell has been passed over in Great Britain as the young of

*Modiolus*, from which, however, its brilliant colouring will almost always distinguish it. The *M. Australis* of Gray is much more closely allied to it, and indeed is barely distinguishable in certain of its forms.

Typically this is a thin and elongated species, and is rather more produced when adult than are individuals of *Modiolus* of similar dimensions; to that species indeed its general outline and characters wear so close a similitude, as to render unnecessary any detailed account of its proportions. It is rather more cylindrical, being somewhat more swollen at the diagonal elevation, is usually less broad at the hinder termination, and has the upper posterior outline occasionally, but obscurely, subretuse; the anterior side, although very short, is nevertheless rather more prominent likewise. The epidermidal coating is, in our British specimens, of a fulvous cast on the adult, and bright yellow in the immature examples, and being transparent, exhibits the exquisite crimson painting which ornaments the posterior surface of the valves. This painting consists of narrow and generally numerous linear rays, either simple or more usually composed of linear angulations; occasionally the entire posterior triangle is wholly or partially clouded with these minute and radiatingly disposed zigzag lines. We have not perceived any distinct beard on any of the individuals we have examined. The beaks are sometimes stained with crimson. The internal nacre, which has often a pale bluish cast, generally, if not always, displays the external radiation. Our largest typical specimen only measures an inch and a half in length, and three-quarters of an inch in breadth. Dr. Philippi, whose Sicilian examples are identical with those we have ourselves taken, but have their epidermis of a brownish horn-colour, mentions a variety with violet rays, and another with only obsolete radiations on a rufous ground. The former variety, which is remarkably scarce in Great Britain, we have figured from a very large specimen belonging to Mr. Jeffreys; it measures quite two inches in length, and displays very characteristically the elongated dorsal margin, a feature which enables us to readily distinguish the adult of this species from *Modiolus.* The violet rays in this example are almost concealed by the epidermis, but are distinctly visible when the shell is held up to the light.

The animal is oblong, its mantle is yellowish-white, plain-edged, freely open in front, and round as far as the distinctly-formed but short anal tube; the branchial region is slightly pouting, and quite plain. The foot is cylindrical, bluish-white, and grooved along its length. The byssus is yellowish. The branchiæ are pale brown.

This species is an inhabitant of our western shores, and is sparingly distributed, yet by no means uncommon. Channel Islands (S. H.); West bay of Portland in fifteen fathoms, gravel, and in seven fathoms at Dartmouth (M'Andrew and E. F.); Exmouth (Clark); Torquay (S. H.); Milford Haven in ten fathoms, and Anglesey in from seven to forty fathoms (M'Andrew and E. F.). In forty-five fathoms off Foula, Zetland (M'Andrew.) "Very rare on the Irish coast, but obtained on each side of the Island." Belfast Bay (Mr. Hyndman and W. T.); Malahide and Portmarnock (Dr. Lloyd and Mr. Warren); Birterbuy Bay, "Dr. Farren" (W. Thompson); Bantry Bay in fifteen fathoms (M'Andrew).

It ranges to the Mediterranean.

### M. BARBATA, Linnæus.

Mussel-shaped, subarcuated, and somewhat lobed below; epidermidal byssus serrated at the edge; surface with concentric wrinkles; dorsal angle much raised; beaks quite terminal.

Plate XLIV. fig. 4.

*Mytilus barbatus*, LINN. Syst. Nat. ed. 12, p. 1156 (from type). — POLI, Test. Sicil. vol. ii. p. 210, pl. 32, f. 6, 7.
*Modiola Gibbsii*, LEACH, Zoolog. Miscellany, vol. ii. p. 34, pl. 72, f. 2. — TURT. Dithyra Brit. p. 200. — FLEMING, Brit. Anim. p. 413. — Brit. Marine Conch. p. 107. — BROWN, Ill. Conch. G. B. p. 78, pl. 27, f. 7.
„ *barbata*, LAMARCK, Anim. s. Vert. (ed. Desh.) vol. vii. p. 22. — PHILIPPI, Moll. Sicil. vol. i. p. 70, and vol. ii. p. 50. — HANL. Recent Shells, vol. i. p. 233.

This rough-looking shell is, from its great attenuation in front, of a subtriangular figure, and often subarcuated; the beaks being absolutely terminal, there is no appearance of any anterior side beyond them. The valves, which are opaque and moderately strong, are decidedly compressed, except at the umbonal region; the diagonal elevation is broad, and not at all carinated; the portion which precedes it is remarkably small and narrow. Beneath the glossy fulvous epidermis which veils the external surface the shell is white, or stained upon the posterior triangle with scarlet or rose-colour; almost the entire exterior is, however, concealed by a most closely-disposed shaggy beard, whose terminal filaments are finely but distinctly serrated on that edge which looks towards the ventral margin. The appressed and broadly triangular bases of these processes (frequently in the case of dead specimens the only vestige of the byssal garment) are arranged in concentric lines, inducing regular crowded and often coarse wrinkles upon the epidermis. The hinder dorsal edge, which is greatly elevated, forms a central well-marked but rounded off obtuse angle with the upper posterior outline, which is but little arcuated; the hinder extremity is very broad, and rather more prominent above than below. The ventral margin is often much incurved, and there is a decided projection of its posterior end beyond the general outline. The internal surface is of a subnacreous white, and often stained with purplish rose-colour at the upper portion.

The breadth of a fair sized specimen was one inch, and its length an inch and a half.

The animal of *Modiola barbata* was observed by Poli, and has recently been examined by Mr. Clark, during the autumn of 1848; he describes it as elongated, thick, mantle freely open and for some little depth, with double-edged reddish-brown margins. The body is large, sub-rotund, and brown; from it springs a byssal foot, with a large cavity in the hinder part for a fine bushy dark byssus; the remainder of the foot is finger-shaped, not pointed, white, and longitudinally grooved. The branchiæ are brown and narrow; the upper leaflet of each pair is not half the depth of the lower. There are no tubes nor orifices in the mantle, and the branchial laminæ are continued close to the posterior extremity. The palps are reddish-brown, long, flat, strongly striated transversely on the inside, and smooth on their outer surfaces.

This is one of our rarer British shells, and essentially of a southern character. At Gorey, in Jersey, we have seen the beach strewed with them to the depth of some inches, at a spot where the rejectamenta of the oyster-fisheries were wont to be deposited (S. H.); but on the English coast individual specimens are much prized. It is taken, but rarely, at Torbay (Mrs. Griffith); Exmouth (Mr. Clark); off Portland in fifteen fathoms, Weymouth in nine fathoms (M'Andrew and E. F.); and at Milford Haven. Mr. Bean states that it occurs, though rarely, at Scarborough, a locality not consistent with its known distribution. In from three to ten fathoms among weeds, at Clew Bay in the West of Ireland (R. Ball, W. Thompson, and E. F.); Youghal, very rare (R. Ball).

It is a member of the Lusitanian fauna, and ranges into the Mediterranean, where it is common.

### M. Ballii, Brown.

*Modiola Ballii*, Brown, Illust. Conch. G. Brit. and Irel. p. 132, pl. 42, f. 34, 35.
„ *vestita*, Thompson, Ann. Nat. Hist. vol. xv. p. 318.

Most unfortunately the single specimen from which this species was described and figured, cannot at present be found by its possessor, Mr. R. Ball, who courteously replying to our inquiries for further particulars to verify its indigenousness, states, that it came into his possession, apparently quite fresh-looking, along with other undoubtedly Irish shells *said* to have been found in Ardmore Bay. We cannot venture to include this shell among our native species on the evidence of report alone; we transcribe, however, the description published by Captain Brown from the lost specimen.

"Shell transversely oblong-ovate; umbones placed very near to one side; a slight groove or furrow emanates from the umbones, and terminates in an oblique line on the margin of the anterior side, on which the colour is golden-yellow; covered with a very glossy olivaceous epidermis, which in certain lights exhibits a metallic lustre; inside highly pearlaceous, with transverse wrinkles towards the extremity; the surface exhibiting gold and coppery metallic reflections, and studded with a number of small circular pits like those left by the small-pox."

Mr. Alder, who made an accurate drawing of the type, whilst temporarily in his possession, has transmitted us a foreign shell, which, on comparison, he at that time regarded as identical with it. This is the *M. agglutinans* of Cantraine, (Bulletin Acad. Sciences Naturelles de Bruxelles, 1835, ii. p. 398) subsequently (1844) and provisionally termed *vestita*, in the second volume of his admirable work upon Sicilian shells (En. Moll. Sicil. vol. ii. p. 51, pl. 15, f. 12), by Dr. Philippi, who had lost the name under which he had received it from Malta. As that species was also unhesitatingly pointed out by Mr. Thompson, well acquainted with Mr. Ball's example, in Mr. Cuming's ample collection of exotic *Modiolæ*, we have appended a careful description of it, since the excellent Latin one of the German naturalist may not be in the hands of many students of British Conchology, with the aim of enabling any fortunate discoverer of further examples of *Ballii*, to determine with still greater exactitude its relation with the curiously encased Mediterranean shell, which imbeds itself in a felt-like ball or coccoon, entangling or immeshing stones fragments of other shells and various marine bodies in its external coating.

Oblong, slightly cylindraceous, rather oblique, thin, ventricose, covered with a shining yellowish chestnut epidermis, under which the surface has an uniform whitish hue ; concentrically marked with rather distant wrinkles of increase, which are usually obsolete in the younger examples, but entirely devoid of folds, undulations, or any other kind of sculpture. Surface diagonally divided into two areas, (of which the posterior is manifestly the larger, and the more convex) by the abrupt frontal elevation of the broad umbonal fold, the upper portion of which presents likewise, in the adult, a brighter and more yellow cast of colouring. Hinder dorsal edge nearly straight, and a little elevated, rather long in the young, about equal to the arcuated posterior margin in the adult. Ventral edge slightly lobed behind, obliquely ascending in front. Anterior side, though very short, distinctly projecting, unsymmetrically rounded at the extremity. Termination of the posterior side, which is but little dilated, rounded, but not broadly so. Umbones prominent, not wide; beaks acute, leaning forward, slightly subspiral, not preceded by any lunule-like dulness. Interior subnacreous white, not stained with coloured markings; hinge-margin a little reflected in front, not crenated or denticulated, in aged shells subemarginated above immediately under the beaks. Length of a rather large individual an inch and three-eighths; breadth scarcely three-quarters of an inch.

We have received the same shell, with the locality "Georgia, United States," attached, from one of our American correspondents, as the *M. castanea* of Say (Journ. Acad. Nat. Sciences of Philadelphia, vol. ii. pt. ii. August 1822, p. 266,) with whose language it is not at variance.

## CRENELLA. Brown.

Shell equivalve, very inequilateral, tumid or compressed; surface covered with an epidermis, and either entirely or partially ornamented by striæ, radiating usually in two diverging fasciculi from the beak. Hinge margin toothless, generally crenulated; ligament linear, internal. Two unequal muscular scars, pallial impression obscure.

Animal oblong, its mantle closed anteriorly, open in front and in the branchial regions where the margins, though not united to form a siphon, constitute pouting and more or less puckered branchial lips; formed into a true and produced tube anally. Adductor muscles unequal. Foot narrow, ligulate, furnished with a byssal groove.

This group of *Modiolæ*, as they are usually considered, has a fair claim to generic rank, equivalent to that of

*Mytilus* and *Modiola*. For it we adopt the designation given to *Crenella decussata*, by Brown, who, however, did not perceive that he was constituting a genus, which really belonged to the *Mytilidæ*, and naturally included several of the shells ranked by himself as *Modiolæ*. The uncharacterized genera *Modiolarca*, of Gray, and *Modiolaria*, of Beck, seem to be synonymous, certainly the latter, with *Crenella* in the extended sense in which we propose to adopt it. The members of the genus are very elegant little shells, and great favourites with collectors. The habit of boring into the test of *Ascidiæ*, indicates an affinity, evident also, on comparison of shell and animal, with *Lithodomus*.

### C. DISCORS, Linnæus.

Moderately ventricose, not marbled, smooth in the middle, rayed with impressed lines (occasionally almost obsolete posteriorly) at the sides; hinder area elevated, somewhat lobated below.

Plate XLV. fig. 5, 6, and Plate XLVIII. fig. 5.

*Mytilus discors*, Linn. Syst. Nat. ed. 12, p. 1159 (from type). — LOVÈN, Index Moll. Skandinav. p. 33.
" *discrepans*, MONT. Test. Brit. p. 169.—TURT. Conch. Diction. p. 112.—DILLW. Recent Shells, vol. i. p. 319.
" *discors*, *var.* β. MATON and RACKETT, Linn. Trans. vol. viii. p. 111, pl. 3, f. 9.
*Modiola discrepans*, LAMARCK, Anim. s. Vert. (ed. Desh.) vol. vii. p. 23. — TURT. Dithyra Brit. p. 202. — FORBES, Malacol. Monensis, p. 44. — Brit. Marine Conch. p. 108 (chiefly). — ALDER, Cat. Moll. Northumb. and Durh. p. 81.—GOULD, Invert. Massach. p. 129, f. 83 (probably).—HANL. Recent Shells, vol. i. p. 242.
(Unnamed.) BROWN, Ill. Conch. G. B. pl. 39, f. 36.
? *Modiola minuta* (fry), COUCH, Cornish Fauna, pt. 2, p. 33 (not described).

A careful examination of the Linnæan cabinet enables us to state positively, that this is the species intended by the illustrious Swede, under the name *discors*. His description was very accurate, and more extended than was usual in the "Systema"; the somewhat puzzling assertion, that the striæ are almost transverse, arose from his regarding the attenuated end, and the wide posterior termination of the mussels as top and bottom.

The valves which are subovate, manifestly dilating posteriorly, instead of being swollen as in *marmorata*, are but moderately convex, and are even shallow at the extremities. Considering their thinness and fragility, they are rather opaque, and are covered with a closely adherent epidermis of various shades of green and olive, more usually in northern examples of an olivaceous brown, generally with a greenish cast towards the edge, and in southern specimens of a somewhat tawny olivaceous green. The shape of the former of these two varieties, we may remark, is more abbreviated, and the dorsal line is rarely quite equal, as in the latter and more produced form, to the space behind it. Of the three subtriangular compartments into which the surface is divided, the posterior is slightly the more elevated, and is rather more than equal in extent to the two remaining ones. Typically, it is crowded with most numerous radiating rib-like striæ, which are simple, not crenated, closely set, but little raised, and, in the adult, almost invariably grown obsolete, except near the ventral margin. There are a few distinct radiating costellæ upon the anterior portion, which are rather broad, not much elevated, and sufficiently apart: the central area is devoid of any sculpture, and appears rather abruptly terminated behind by the superior elevation of the posterior portion. The general inclination of the ventral margin is not far from straight, but its outline is rather flexuous in detail, arching out more or less in the middle, and again, more or less abruptly, at the commencement of the posterior compartment, so as to render the latter sublobated in appearance. The hinder dorsal edge sloping upwards in a nearly straight and moderately ascending line unites itself with scarcely any angulation to the posterior outline: this latter forms an uninterrupted sweep to the commencement of the sublobated portion ; its chief swell being nearly in the middle, whence it so runs downwards as to give a slightly truncated look to the lower part of the hinder extremity. Both extremities of the shell are rounded, though neither of them symmetrically so. The umbones are not prominent; the beaks are nearly terminal, acute, and much inflected. The interior is iridescent white, with its margin only crenated at the extremities.

A large individual now before us, measures seven tenths of an inch in length, and five lines in breadth.

"The animal," says Mr. Alder, in his Catalogue of the Mollusca of Northumberland and Durham, "is white, and, assisted by its long strap-shaped foot, can move about pretty quickly ; but it generally prefers a stationary life, and forms for itself a kind of nest or case, by stitching together the small sea-weeds and corallines with its byssal threads ; here it remains attached by its byssus, awaiting the food that may come within its reach. When viewed in a living state there appear to be two syphons at the longer end of the shell, but only the posterior of these has the walls complete ; the other has its anterior side open, formed by a fold in the cloak, as in the siphons of the zoophagous gasteropods. The animal has consequently only two pallial apertures."

Common all round our shores, and often very plentiful among the roots of Laminariæ and among corallines. It ranges from low-water mark to thirty fathoms, at which depth we have found it in the Irish Sea, off Anglesea, in the line of strong currents, enveloped in nests formed of fragments of *Flustra foliacea* and masses of sand agglutinated together and combined by byssal threads. Mr. Alder has observed a slender nearly smooth variety among the rocks at Staffa. It ranges throughout the European seas, and probably also to the shores of Boreal America.

### C. MARMORATA, Forbes.

Tumid, oblique, usually marbled with coloured markings, smooth in the middle, rayed with impressed lines at both extremities ; beaks quite terminal.

Plate XLV, fig. 4.

*Mytilus discors* (not of Linn. nor Fabr.), DA COSTA, Brit. Conch. p. 221, pl. 17, f. 1. — PULTENEY, Hutchins, Hist. Dorset. p. 38. — DONOV. Brit. Shells, vol. i. pl. 25, f. 1. — MONT. Test. Brit. p. 167.— MATON and RACK. Linn. Trans. vol. viii. p. 111. (not var.) pl. 3, f. 8. — LASKEY, Mem. Wern. Soc. vol. i. p. 393. — RACKETT, Dorset Catalog. p. 40, pl. 2, f. 1. — TURT. Conch. Diction. p. 112.—POLI, Test. Sicil. vol. ii. p. 211, pl. 32, f. 15. —DILLW. Recent Shells, vol. i. p. 319. Index Testaceolog. pl. 12, f. 39.—MAWE, Conchology, pl. 13, f. 5.

*Modiola* „ (not of Lamarck), TURTON, Dithyra Brit. p. 201, pl. 15, f. 4, 5.— FLEMING, Brit. Anim. p. 413. — MACGILLIV. Moll. Aberd. p. 239.—Brit. Marine Conch. p. 108.

*Mytilus discrepans*, DESHAYES, Encyclop. Méthod. Vers. vol. ii. p. 567.

*Modiola marmorata*, FORBES, Malacol. Monens. p. 44. — BROWN, Ill. Conch. G. B. p. 78, pl. 27, f. 10.

„ *discrepans*, PHILIPPI, Moll. Sicil. vol. i. p. 70, and vol. ii. p. 50, pl. 15, f. 11.

„ *tumida*, HANL. Recent Shells, vol. i. p. 241, pl. 12, f. 39.

„ *Poliana*, PHILIPPI, Zeitschr. Malacol. 1844, p. 101 (from type).

Few shells have been the subject of more discussion than the *Mytilus discors* of Linnæus, which epithet, usually bestowed by foreign writers upon the large Australian species (*impacta*), has, till of late years, been almost universally claimed by our own authors for the shell we are about to describe. The all but simultaneous observation of its distinctiveness by three conchologists has caused the imposition of three new names upon this long known mussel. The valves are thin, fragile, obliquely oval or rather subtrapeziform in figure, and greatly swollen; the swell is chiefly manifest upon the umbonal ridge, which is, however, rounded and not carinated, and is not followed by any retusion of surface, or any abrupt compression. The exterior, which is covered with a thin shining transparent epidermis, varying from greenish oil-colour to a clear light brilliant green, is more or less painted with minute linear angulations of a liver-colour upon a pale or whitish ground. It is divided into three compartments, of which the hinder is about equal to the other two united, its front limit usually defined in the adult by a slight retusion, that almost diagonally runs across the shell. The anterior space, which is the smallest of the three, is radiated with at least a dozen most closely set costellæ or small ribs, whose surfaces are obtuse and but little convex, which are but little raised above their narrow interstices, and which, although not really crenulated, often appear so from the epidermidal wrinkles. The middle space is smooth, and has the shape of a curvilinear triangle. The hinder or terminal compartment, which commences a little before the umbonal fold, is radiated similarly to the front area, but has its more numerous costellæ so much more crowded that it should be rather termed striato-sulcated than ribbed. The upper and lower margins of the shell run nearly parallel to each other, and are straightish in their general outline; the ventral edge, however, swells out a little in the centre of the middle compartment, and appears subretuse at its extremities; it rises too, far more obliquely and rapidly in front of the shell than at its termination. The umbones are swollen, and the beaks are terminal or nearly so, not unfrequently projecting beyond the curved anterior outline. The hinder end, which, from the greater projection below of the produced and arcuated posterior outline, occasionally appears bluntly wedge-shaped, is also rounded both above and below, there being no decided angulation of the horizontal (or even ascending) dorsal margin, which, moreover, rarely exceeds the length of the space that extends from its cessation posteriorward.

Three-quarters of an inch in length, and about five lines in breadth, are the dimensions of rather a large individual.

The animal of this species was carefully examined by Mr. Clark in 1835, and re-examined by that excellent observer last year. His notes are of such interest, that we print them entire as communicated. "Animal elongated, thick, oval, pale yellow; mantle closed in the anterior ventral half, where it makes a considerable opening for the emission of the foot; it is then again closed and forms a red purplish and flaky-white membrane, which is produced into a small cylindrical anal tube, grooved at the base, and with four or five very minute dark cirrhi at the terminus. This grooved anal siphon carries on each side of it the mantle formed into small pendulous flaps of the same colour as the tube, and the animal by bringing their margins into contact forms together with the groove under the anal tube a canal to convey water to the branchiæ; excepting these small puckered flaps, the margin of the mantle where open is plain. The foot is white with a very deep byssal groove at the point of its elbow, from whence a strong byssus issues and fixes the animal to shells, stones, the *Ascidia mentula*, &c. The anterior part of the foot is white, very narrow, and finger-shaped, moderately pointed; but when fully extended it takes the form of a very narrow flat tape, with a slight brown line running longitudinally from its base to the point: it is protruded by the animal close by the anterior side of the byssus. As an organ of locomotion it can be of little use until the animal liberates itself, which it has, we believe, the power of doing to change place: it may be of use as an organ of tact. Change of place can only be effected when it is fixed to stones, and not when buried in the coriaceous coat of the *Ascidia*. Its mode of operation to detach itself from stones, &c., is to discard the old byssus and spin another elsewhere, as we have seen. There are on each side of the body two pale orange-coloured branchiæ, smooth on all surfaces; also two subtriangular, long, pointed, pale brown pectinated, pendulous palps."

C. *marmorata* is common wherever *Ascidiæ* are found, all round our coasts, and in many places is very plentiful, enjoying a range in depth of from low-water mark to forty fathoms. It burrows in the tests of tunicated mollusks, especially *Ascidia mentula*. "In the skin of *Cynthia tuberosa* and *Ascidia sordida*, especially the latter" (Alder). "In the coats of tunicated mollusks generally, both simple and compound" (W. Thompson). It ranges throughout the European seas, and is an ancient species, dating its appearance within our own area from the epoch of the coralline crag.

## C. nigra, Gray.

Elongated, rather compressed, not distinctly lobated, most closely radiated (except in the middle) with raised and crenulated striæ; epidermis brown in the adult, greenish in the young.

Plate XLIV. fig. 5, and (Animal) Plate Q, fig. 7.

*Mytilus discors, var.* Chemn. Conch. Cab. vol. viii. p. 195, pl. 86, f. 767.
„ „ Schröter, Einleit. Conch. vol. iii. pl. 9, f. 15.
„ „ *var. Succicus,* O. Fabr. K. Dankse Videnskab. Selskab. (Nye Samm.) 1788, p. 460 (in part).
„ *discrepans,* Mont. Test. Brit. Suppl. p. 65, pl. 26, f. 4.—Leach, Zoolog, Miscellany, vol. ii. p. 36.—Index Testaceolog. pl. 12, f. 38.
*Modiola nigra,* Gray, Appendix to Parry's Voyage to North Pole. — Brit. Marine Conch. p. 249, f. 5.—Alder, Cat. Moll. Northumb. and Durh. p. 81. — Hanl. Recent Shells, vol. i. p. 242, pl. 12, f. 38.
„ *discrepans,* Fleming, Brit. Anim. p. 413. — Macgilliv. Moll. Aberd. p. 238. — Brown, Ill. Conch. G. B. p. 78, pl. 27, f. 8.—Sowerby, Genera Shells, Modiola, f. 3.—Reeve, Conch. Systemat. pl. 100, f. 3. — Philippi, Zeitschr. Malacol. 1844, p. 102.
„ *compressa,* Menkè, Cat. Conch. Malsburg (from Chemnitz's fig.).
„ *depressa,* Hanl. Recent Shells, vol. i. p. 242, note.
*Crenella nigra,* King, Ann. Nat. Hist. vol. xviii. p. 239.

Although this rare shell was delineated in Montagu's Supplement to the "Testacea Britannica," as a large example of his *discrepans*, the specific differences are of an easily appreciable character: the most readily perceptible are the nature of its striæ, and the absence of any marked lobation. Its shape is more or less oblong, and slightly arcuated; dilating chiefly just behind the middle, and again attenuating posteriorly, it becomes decidedly narrow at the front extremity, which latter projects rather more than in our *discors*, as the acute and tolerably prominent beaks are not quite terminal. None of the British examples we have seen are otherwise than fragile and rather thin; those from Newfoundland, however, are considerably more solid. The epidermis, which entirely clothes the surface, and which shines with a resinous lustre, varies in colour according to the age of the specimen; in the young it is tawny, with an olivaceous tinge, changing into green towards the front of the shell; old specimens are of an almost uniform pitchy brown; intermediate stages of an olive green in front, and chestnut or tar-coloured posteriorly. The valves are shallow, especially in front, and are much more compressed below than those of the true *discors*. The general inclination of the ventral edge is retuse in the adult, and nearly straight in the young, there being no decided bulging out of outline in the centre, nor any marked posterior lobation. The hinder dorsal edge is nearly rectilinear, only very moderately elevated, and so perfectly free from angulation at its junction with the hinder margin, that its point of union is almost imperceptible; the latter slopes gently downward in a long arcuated sweep from the highest point, (which is usually either midway from the front extremity, or else from the beaks,) so that the chief swell is below the middle of the posterior side, which, as well as the anterior, is well rounded. There is no abrupt depression of surface preceding the posterior compartment, which in truth is little raised above the rest of the area, and almost comprises two-thirds of the entire superficies: this portion is occupied by most numerous elevated radiating striæ. These, although crowded, are distinctly separated from each other, and particularly towards the upper or dorsal edge, are distinctly crossed, as well as their interstices, by fine raised concentric striulæ, which subgranularly crenate (and occasionally even imbricate in a slight degree) the radiating ones; the latter do not suddenly cease in front, but gradually diminish in elevation and thickness. Similar rib-like striæ adorn the anterior commencement of the shell; the intermediate area is apparently smooth, but when highly magnified, displays an elegant chasing of minute and often interrupted concentric wave-like corrugations. The interior is subnacreous white, with a somewhat livid cast; the margin is not crenulated in the middle, but in aged and large examples becomes not unfrequently subgranular near the beaks. An individual, which we regard as rather large for a British specimen, measures three-quarters of an inch in breadth, and an inch and three-tenths in length. Our Newfoundland examples are at least two inches in length, and full half that breadth; and both Dr. Fleming and Mr. Barlee state that British individuals of two inches in length are occasionally to be met with.

The animal of this species has been observed by Mr. Alder, who kindly communicated the drawing from which we have taken our figure. It is of a transparent white hue, with the margin of the cloak and syphon tinged with pink, and speckled with brown and opaque white.

This rare and fine shell is of boreal origin, and in Britain occurs only in northern habitats. It has long been known in the Frith of Forth, where we have dredged it on the oyster-beds in seven fathoms; and in a MS. note of Captain Laskey's it is remarked that this species was originally much more plentiful there than latterly, the numbers having been diminished by the avidity with which it was sought after by fishermen, on account of the ready sale they found for specimens. In England it is only known from the North Eastern coast, where it has been taken at Cullercoats by Mr. Alder, who also enumerates among its localities "Whitburn (Rev. G. C. Abbes). Mr. Howse dredged it alive in seventeen fathoms. Mr. King has also got it from the fishing-boats." Rare at Scarborough (Bean). Lieutenant Thomas has taken it in seven fathoms, off the Dudgeon, in the Frith of Forth, and in Orkney. It has occurred at Oban in eighteen fathoms, on the west coast of Zetland in seventy fathoms, and on the same coast as deep as ninety at a distance of thirty miles from shore, (M'Andrew and E. F.) Mr. Jeffreys has taken it in several localities in the Hebrides. Mr. Alder remarks that Oban specimens are broader than usual posteriorly, and have a greenish epidermis.

It is a well-known inhabitant of the banks of Newfoundland, and, in Europe, of the Norwegian seas.

### C. COSTULATA, Risso.

Oblong, marbled with livid zigzag lines, with radiating grooves at each end; anterior extremity very narrow, distinctly projecting beyond the umbones.

Plate XLV. fig. 1.

*Modiola costulata*, RISSO, Hist. Nat. l'Europe Mérid. vol. iv. p. 324, f. 165 (fide Philippi—badly fig. and descr.).—JEFFREYS, Annals Nat. Hist. vol. xix. p. 313. — PHILIPPI, En. Moll. Siciliæ, vol. ii. (not vol. i.) p. 50, pl. 15, f. 10 (not of D'Orbigny Moll. Canarr. nor Hanl. Recent Shells, vol. i. p. 240).

This very beautiful shell, whose existence in our seas was first indicated by Mr. Jeffreys in the nineteenth volume of the "Annals of Natural History," but of which no description has hitherto been published in any English work, might, at first sight, be passed over as either *marmorata* or *discors*, to both which species it bears considerable resemblance, uniting the general shape and characters of the latter to the marbled painting of the former. Its form is more elongated than that of either, and exhibits a different proportion in its component parts. We must preface our description of this shell by observing, that we have seen too few specimens of it to determine whether the characters we have noted and delineated should be regarded as essential, or as liable to alteration. Of its distinctness as a species, we entertain no doubt. The valves are small, oblong, or elongated oblong, and much narrowed in front; they are moderately thin, ventricose, and covered with a lustrous epidermis of a clear semi-transparent bluish green, beneath which the shell is variegated with zigzag markings of a reddish liver colour on a paler ground; this marbling is not partial or confined to the umbones, although more profusely displayed there, or from the greater tenuity of the epidermis at that part, more distinctly apparent upon them. The external surface is radiatingly divided into three areas, of which the hinder, although occupying twice the actual superficies of the other two united, does not extend at the ventral margin to quite the middle of it, although advancing further than in the two species previously referred to. This area, which in our most characteristic examples is abruptly elevated above the general level, is closely radiated with, at least, twenty sulci, whose terminal interstices in the larger individuals are elevated into distinct costellæ, with faint and close concentric striæ in their intervening furrows. The few depressed ribs which occupy the anterior area are broad and rather far apart, their interstices about equalling them; the line of demarcation between them and the smooth and larger central area is not defined. At the junction of the front and middle areas, the ventral margin, whose general outline is straightish, is a little retuse; it swells out again a little in the centre, becomes again retuse, and finally, by its sudden projection along the base of the hinder area, gives that portion of the shell a lobated appearance. The anterior half of the shell is much narrower than the posterior,—the shell being regularly attenuated to its front extremity, which is extremely narrow, well and not obliquely rounded, and distinctly projecting beyond the umbones. The straightish and ascending hinder dorsal edge, having united with the posterior one without angularity, runs in a gentle arcuated sweep to the posterior extremity, and thence suddenly descending, forms a broad and rounded termination to the shell. The umbones are but little swollen ; the interior is brilliantly nacreous, with the margin distinctly crenated at the bases of the ribs.

The very beautiful example which we have figured from Mr. Jeffreys's unrivalled collection, measures half an inch in length, and rather more than a quarter of an inch in breadth. These dimensions exceed those assigned to the Mediterranean examples by Dr. Philippi, from whom we have received small specimens, that perfectly agree with our own in contour, sculpture, and painting. The ribs are not very distinctly developed in the younger shells (nor upon the umbonal region of the adult) ; neither at that stage does the epidermis display the verdant hue which so ornaments the surface of the mature shell.

It has been taken at Exmouth by Mr. Clark, in Cornwall by Mr. Alder and Miss Lavars, and at low-water mark in Oxwich Bay, near Swansea, by Mr. Jeffreys.

### C. RHOMBEA, Berkeley.

Very small, somewhat rhomboidal, whitish; entire surface sculptured with radiating lines.

Plate XLV. fig. 3.

*Modiola Prideauxiana*, LEACH, Zoolog. Miscellany, vol. ii. p. 35.—BROWN, Ill. Conch., G. B. p. 78, pl. 27, f. 9.

„ *rhombea*, BERKELEY, Zoolog. Journal, vol. iii. p. 229, suppl. pl. 18, f. 1 —Brit. Marine Conch. p. 107.—BROWN, Ill. Conch. G. B. p. 78, pl. 39, f. 17.

Although this extremely rare shell had previously been observed by Dr. Leach, yet as his brief description, unaccompanied by a figure, is so entirely inadequate for its recognition, that, without a knowledge of the typical example, it would have been impossible to ascertain what was intended by it, we have preferred the name subsequently assigned to it by Mr. Berkeley. It is a remarkable-looking species, and incurs not the slightest risk of being mistaken for any other British shell, but bears, when worn, a close resemblance to the young of *C. sulcata.* The shape is rather oblique, somewhat rhomboidal, and occasionally a little arcuated; the chief dilation is a little beyond the middle, the hinder termination being distinctly attenuated. The valves, which are white, covered when recent with a pale yellow epidermis, are much swollen, or gibbous, above upon the umbonal fold, but are compressed near the dorsal angle, and rather quickly diminish in convexity towards the ventral margin. Their texture is rather strong for their size, and neither transparent nor vitreous; the exterior is not polished, though a little glossy, and is most exquisitely sculptured by radiating lines, which are delicate and most closely set in front, but elevated, more distant, a little divergent, and often bifurcated posteriorly. In the perfect state these are fringed, as it were, by rather remote and very delicate concentric laminæ, that are chiefly apparent on, if not indeed confined to, the hinder portion of the shell, and when worn off, indicate their former presence by a kind of interrupted or obsoletely articulated appearance which they bestow upon the radiating striæ. The ventral margin is retuse in the middle, and convex at the extremities; it ascends more rapidly, but still arcuatedly, in front. The hinder dorsal edge, which, although constantly elevated, varies much in height, rendering the shell more elongated when the dorsal angle is less developed, more abbreviated when the rise is more manifest, forms a rounded off but distinct angle with the posterior margin; the latter, after arching out, becomes incurved a little below the middle of the hinder side, thus giving a somewhat lobated appearance to the narrow and well-rounded tip of the posterior side. The beaks are prominent, and being terminal, project beyond the anterior end, which is not at all angulated, but is arcuatedly cut off below, so that the lower portion is the more receding. The largest recorded example is stated by Capt. Brown to have measured a quarter of an inch in length, and an eighth of an inch in breadth; such dimensions are, however very uncommon, the average length not exceeding a fifth of an inch. Some of the best specimens as yet found are the two preserved in the National Museum, and presented respectively by Mr. Prideaux, who obtained his shell on the Devonshire coast, and the Rev. Miles Berkeley, who dredged a single individual at Weymouth adhering by its byssus to a large mass of slate. Odd valves have occurred to us in shell sand from Herm (S. H.); Mr. M'Andrew dredged it in 20 fathoms off Penzance, and Mr. Barlee off Brora Island.

### C. decussata, Montagu.

Minute, obliquely suborbicular; entire surface radiated with elevated striæ.

Plate XLV. fig. 2.

*Mytilus decussatus*, Mont. (not Lamarck), Test. Brit. Suppl. p. 69. — Laskey, Mem. Wern. Soc. vol. i. pl. 8, f. 17. — Turt. Conch. Diction. p. 114.—Fleming, Brit. Anim. p. 411.
*Crenella elliptica*, Brown, Conch. Text-book (1833), p. 143, pl. 18, f. 13; Ill. Conch. G. B. p. 75, pl. 23, f. 12, 13, 14.
? *Modiola glandula*, Totten, Silliman's Journ. vol. xxvi. p. 367, f. 3. — Gould, Invert. Massach. p. 131, f. 87. — Hanl. Recent Shells, vol. i. p. 243.
*Crenella decussata*, Macgilliv. Moll. Aberd. p. 229.—Brit. Marine Conch. f. 5. —Alder, Cat. Moll. Northumb. and Durh. p. 82.
*Modiola faba* (not *Mytilus faba* of O. Fabric.), Brit. Marine Conch. p. 248.
,, *cicercula*, Möller. Index Moll. Groenlandiæ, p. 19. — Hanl. Recent Shells, vol. i. p. 243.

This pretty little species is very ventricose at the umbones, whence its convexity regularly and gradually diminishes in all directions. Its valves are thin and fragile, yet not particularly so for their minute size, and are covered with a rather dull ashy olivaceous or pale olive-coloured epidermis, beneath which the surface appears white. The very many raised and somewhat granulated striæ, which radiatingly adorn the entire exterior, are all nearly equally strong, more or less divergent, and very closely disposed, since the interstices, as they widen, become filled up with intermediate costellar striæ; the granules are much crowded, and very minute. The shape is so obliquely oboval, the beaks are so acute, and project so much beyond the front extremity (which, moreover, is obliquely cut off, as it were, below) that the natural mode of viewing the contour appears to be with the beaks upright and the central striæ perpendicular; in which case the former appear exactly in the middle, and the two short dorsal edges, after forming a nearly similar angle, run with equal arcuation to the well-rounded base, so that the shell appears almost symmetrically equilateral, and very like a minute and earless *Lima*. Holding it, however, in the same position as the *Modiolæ*, we should describe the hinder dorsal edge, as short, straightish, greatly ascending, and merging without marked angularity, into the posterior margin, which latter arching out with a bold sweep, and almost symmetrically rounding the hinder termination, passes without interruption into the anterior or front ventral margin. Although single valves are found of larger dimensions, we have seen no pairs which have been taken in Great Britain, that measure more than a sixth of an inch in length and an eighth of an inch in breadth. Nevertheless, if, as we surmise, for we can perceive no variation of specific importance, the *glandula* of Totten prove identical, it attains to at least half an inch at Maine and elsewhere in the United States of North America. The shape of full-sized individuals of this Transatlantic variety is more rhomboidal and much broader, with a distinct curved anterior edge, which forms more than a right angle with the hinder dorsal margin.

This is a northern species, first discovered by Laskey, and, until of late years, specimens were rare in cabinets; the active exertions of Mr. Jeffreys, Mr. M'Andrew, and Mr. Barlee, in little explored localities, have made it more common. On the English coast it has been found very rarely at Scarborough by Mr. Bean; off the shores of Northumberland, where it has been found at Cullercoats and Fern Island by Mr. Alder, by Mr. King in the cavity of a small stone from deep water, and by Mr. Howse, alive in seventeen fathoms. On the coast of Scotland it occurs in numerous localities from Oban round to the

Moray Firth and Aberdeenshire. The following instances will illustrate its range in depth,—Icolmkill, five fathoms; coast of Zetland, abundant in Balta Sound in from five to ten fathoms, and ranging in other places as deep as fifty fathoms to fifty-five fathoms; nine miles off Cape Wrath, sandy ground, and in fifteen fathoms, Moray Firth (M'Andrew). In from seven to fifteen fathoms, Orkneys (Thomas); moored by its byssus under stones at low water, Loch Carran (E. F.). "A few odd valves were dredged from about ten fathoms on a shelly bottom in Strangford Lough, by Mr. Hyndman and myself in August, 1832." (W. Thompson.)

It is a boreal shell, ranging along the coasts of Norway, Greenland, and Boreal America.

## SPURIOUS.

### LITHODOMUS ARISTATUS, Dillwyn.

*Le Ropan*, ADANSON, Senégal, p. 267, pl. 19, f. 2.
*Mytilus lithophagus striatus* (1804), J. SOWERBY, Linn. Trans. vol. viii. p. 274, pl. 6, f. 2.
*Mytilus aristatus* (1817), DILLWYN, Recent Shells, vol. i. p. 303. — Index Testaceolog. pl. 12, Mytilus, f. 8.
*Modiola caudigera* (1819), LAMARCK, Anim. s. Vert. vol. vi. pt. 1, p. 116.—Do. (ed. Desh.) vol. vii. p. 27.—HANL. Recent Shells, vol. i. p. 238, pl. 12, Mytilus, f. 8.—PHILIPPI, Abbild. Neuer Conch. vol. ii. p. 149, Modiola, pl. 1, f. 5.
*Lithodomus caudigerus*, SOWERBY, Genera Shells, Lithod. f. 4.—REEVE, Conch. Systemat. pl. 99, f. 4.
*Lithodomus lithophagus* (not of authors), FLEMING, Brit. Anim. p. 414. — British Marine Conch. p. 111.
Encycloped. Méthodique, Vers, pl. 221, f. 8.

*Introduced into British Conchology from having been discovered imbedded in stone used for repairing the roads near London, and surmised to have come from Plymouth. It is a native of Senegal and the West Indies.*

### L. FUSCUS, Gmelin.

LISTER, Hist. Conch. pl. 359, f. 197.—SCHRÖTER, Einleit. Conch. vol. iii. p. 459.

*Mytilus fuscus*, GMELIN, Syst. Naturæ, p. 3359 (only from Lister's figure).—DILLW. Recent Shells, vol. i. p. 306.—BROWN, Mem. Werner. Soc. vol. ii. p. 513.—TURT. Conch. Diction. p. 113 (copied from last).—Index Testaceolog. pl. 12, f. 12.

*Modiola cinnamonea*, var. LAMARCK, Anim. s. Vert. (ed. Desh.) vol. vii. p. 25.

„ *fusca*, DESHAYES, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 28.—HANLEY, Recent Shells, vol. i. p. 239, pl. 12, f. 12.

*An E. Indian shell; introduced by Captain Brown, in the Wernerian Memoirs, as found at Sligo.*

## ARCADÆ.

The shells of this family are easily recognized by the peculiar dentition of their hinges, which are furnished with small comb-like interlocking teeth, all similar, or differing only in size and often very numerous. The characters of sculpture, outline, size, and thickness vary in the several genera. The shells of all, however, are provided with an epidermis. The animals of all the forms have a deeply-grooved foot, capable of expanding into a disk like the foot of a gasteropod. The margins of the mantle are usually freely open, and not formed into tubes posteriorly, though in *Leda*, and probably in *Solenella*, they present the latter arrangement; consequently, the form of the pallial impression in the shell varies in this tribe. There are constantly two adductor muscles, the impressions of which are strongly marked on the shells. The structure of the appendages of the mouth afford generic distinctions.

### NUCULA. Lamarck.

Shell equivalve, inequilateral, shortened anteriorly, ovato-trigonal or obliquely ovate, closed, smooth, or concentrically striated, or (in certain exotic and fossil species) marked by zigzag or radiating furrows; always invested with a smooth epidermis; margin denticulated or smooth; beaks approximated, incurved; inside nacreous: hinge-line angulated, a ligamental fossette at the angle, and a range of comb-like, small, sharp teeth on each side; ligament chiefly internal. Pallial impression entire.

Animal subtrigonal, its mantle freely open, without siphonal tubes and with plain edges. Foot deeply grooved and forming an ovate pedunculated disk with serrated edges. One in each pair of labial palps long, curled, linear and fimbriated at its margins; the other short and filiform.

The *Nuculæ* are beautiful little bivalves, remarkable for their clean and often glossy aspect and quaker-like hue of their coats. They live in sand or mud, and are never fixed. They inhabit all depths of water, from near tide-marks down to the deepest regions in which Mollusca have been found. The species are sparingly distributed throughout the seas of both hemispheres, and the genus, geologically, ranges back to the oldest fossiliferous strata. We adopt the group as restricted by Möller.

Dr. Carpenter has examined the microscopic structure in our commonest British species of this genus, and finds the inner layer of the shell to present a truly nacreous structure; in the outer a smaller amount of tubular structure may be observed.

### N. NUCLEUS, Linnæus.

Never rayed; epidermis not lustrous; hinder extremity blunt, its dorsal area not sculptured; inner margin crenated.

Plate XLVII. fig. 7, 8, and (Animal) plate P. fig. 4.

*Arca nucleus*, LINN. Syst. Nat. ed. 12, p. 1143 (in part).—PENNANT, Brit. Zool. ed. 4, vol. iv. p. 98 (probably).— DONOVAN, Brit. Shells, vol. ii. pl. 63, side figs.—MATON and RACK. Linn. Trans. vol. viii. p. 95.

*Glycimeris argentea*, Da Costa, Brit. Conch. p. 170 (in part), pl. 15, f. 6 (on the right).

*Nucula margaritacea*, Lamarck, Anim. s. Vert. (ed. Desh.) vol. vi. p. 506 (chiefly). — Brown, Illust. Conch. G. B. p. 85, pl. 33, f. 12. — Philippi, Moll. Sicil. vol. i. p. 64, and vol. ii. p. 45.

„ *nucleus*, var. β. Lovèn, Index Moll. Skandinav. (from specimens).

This very abundant species (at least to the dredger, for it is rarely thrown perfect upon the shore) is of a shortened subtriangularly ovate form, seldom oblique, moderately convex, strong in texture, and covered with a dull olivaceous yellow, or ashy-olive coloured epidermis, the surface beneath which is of an uniform white, and entirely devoid of any coloured rays. The exterior is almost smooth in the middle, and on the umbones, but at the sides and base is marked with very faint radiating striæ, which are occasionally obscurely decussated by rather strongly marked lines of growth and slightly elevated wrinkles. The ventral edge is moderately arcuated, and rises rather the more in front; the hinder dorsal edge slopes with but little convexity, and uniting with the ventral without angulation forms a somewhat tapering and bluntly rounded termination to the produced posterior side. The front margin does not abruptly decline (although the anterior side is still very short) in a straight line, but is sinuous, a very obscure emargination terminating it below, above which it swells out a little, so as to give a sort of pouting appearance to the lips of the lunule. This latter, which is only defined by a slight retusion of the surrounding surface and the absence of radiating striulæ, is large and destitute of sculpture. The hinder dorsal area is a little flattened, and its lips bend inward; it is likewise devoid of all sculpture, or marked characteristics. The umbones are not peculiarly prominent, nor are the beaks, which curve forward, very acute. The inside is nacreous, with usually a bluish cast; the hinge-margin is broad, and provided with about twenty teeth behind and about ten in front, which appear to vary very greatly in elevation, but are typically very long, and most elevated towards the extremities of each series.

An ordinary-sized individual measured two-fifths of an inch in length, and rather more than a third of an inch in breadth.

The animal is shaped like the shell; and is of a yellowish or brownish-white hue. The mantle is open throughout in front and posteriorly, not forming any siphons, and having its margins quite plain. The foot is white, and as if pedunculated and deeply grooved, so as to expand into a broad leaf-shaped disk with serrated margins: by means of this organ it can creep like a gasteropod, and we have seen it walk up the sides of a glass of sea-water in which we had it confined for observation. The structure of the branchiæ and margins of the mouth have been carefully examined by Mr. Clark, whose description we prefer: "The branchiæ are pale reddish-brown equal rather elongated lamina, two on each side, running pretty straight longitudinally and hanging parallel to each other, free, plain on their outer surfaces, and finely pectinated on the inner. There are two labia on each side hanging from the anterior end of the branchiæ, one being very small, like a minute leaf, of a deep brown colour; the other white, folded together, with the edges scalloped, puckered, or plaited, forming a furrow with its open part anterior, and terminating posteriorly in a spiral curl, having the extreme point a little cloven; this labium is three or four times the size of the smaller. Besides the pair of labia in each side there is a long membrane puckered, folded together, forming a furrow (like the larger labia) on each side the mouth, and running downwards, partially curling around the anterior muscle, of a pale brown colour." The vibratile cilia of the branchiæ are very large.

It is distributed, often in great abundance, all around our shores. It frequents a coarse bottom and rather deeper water—from seven to ten fathoms—than its near ally *nitida* (S. H.). It occurs also, and in sufficient plenty, usually on a bottom of gravel or muddy gravel, at much greater depths, as twenty, thirty, forty, and even as deep as eighty and ninety fathoms (E.F.). It ranges throughout the European seas, and occurs fossil in both red and coralline crags.*

### N. NITIDA, Sowerby.

Triangular, either rayless, or with the rays linear and dark grey; epidermis highly lustrous; hinder extremity tapering, its dorsal area not sculptured; inner margin crenated.

Plate XLVII. fig. 9.

*Arca nucleus*, MONT. Test. Brit. p. 14 (chiefly). — DILLW. Recent Shells, vol. i. p. 244 (in part).

*Nucula nitida*, SOWERBY, Concholog. Illustrations, Nucula, No. 29, f. 31. — HANLEY, Recent Shells, vol. i. p. 171, pl. 19, f. 44.

So closely does this shell approach the preceding in general features, that in place of recapitulating characteristics common to both, we shall merely indicate their points of difference. That most immediately perceptible is the highly lustrous epidermis of an ashy olive colour, beneath which the surface is occasionally adorned with dark grey linear rays. The shape is more triangular, being less blunt likewise at the hinder termination. The anterior edge is less sinuous, and more abrupt, the lunule not being so projecting; and the front basal angulation is much more sharply defined. The slope of the hinder margin is also more considerable, and the posterior rise of the ventral edge more sudden. The valves are thinner; the hinge-margin less broad, and the teeth are not ordinarily quite so produced: the cartilage support, for the most part, does not project so far inward, but is more oblique. The dimensions are very slightly less than in the species with which we have been comparing it.

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* The *N. argentea* of Brown (Illust. Conch. G. B. p. 85, pl. 33, f. 14, 15.) solely constituted from a single valve of little more than a line in length, and said to resemble the fry of *N. margaritacea*, is thus described:—

"Obliquely ovate, very glossy, and smooth; colour olivaceous; umbones placed much to the posterior side, with a cordiform depression beneath; inside glossy, silvery white; hinge with 12 (!) rather strong, regular, upright teeth; margins with very fine crenulations.—Dunbar."

No distinctions have as yet been detected between the animal of this and the last species.

Everywhere on the south coast, always in shallow water in sand (S.H.); Dartmouth, in twenty-seven fathoms, sand, eight miles from shore (M'Andrew and E. F.); Oxwich Bay, near Swansea, in sand at low-water mark, Fishguard and Manorbeer (Jeffreys); Lundy Island, in seven to twenty-eight fathoms (M'Andrew); Tenby (S. H.); Scarborough (Bean); on the Northumberland and Durham coasts, in deepish water and thrown up in sand, rather rare (Alder). In many localities of the Hebrides (Jeffreys, Barlee). Var. "*erosa*," Jeffreys, at Oban. Dealvoe, Zetland (Jeffreys); Moray Firth, in thirty-four fathoms (M'Andrew); Dundalk, Portmarnock, and Youghal, in Ireland (W. Thompson). Off Cape Clear, in thirty fathoms (M'Andrew).

Lovèn records this species as an inhabitant of the shores of Sweden.

### N. RADIATA, Hanley.

Elongated-trigonal, with rufous rays; epidermis but slightly glossy; hinder extremity tapering, its dorsal area not sculptured; inner margin crenated.

Plate XLVII. fig. 4, 5, and XLVIII. fig. 7.

*Arca nucleus*, PULTENEY, Hutchins, Hist. Dorset, p. 35.—MATON and RACK. Dorset Catalog. p. 37.—TURTON, Conch. Diction. p. 8, f. 1, 2.
*Nucula nucleus*, TURT. Dithyra Brit. p. 176, pl. 13, f. 4.—Brit. Marine Conch. p. 105, f. 74.—MACGILLIV. Moll. Aberdeenshire, p. 243.
„ *nuclea*, FLEMING, Brit. Anim. p. 401.
„ *margaritacea*, BLAINVILLE, Manuel' de Malacologie, pl. 65, f. 5 (not well).—SOWERBY, Conch. Manual, f. 137.

This elegant *Nucula* is almost exactly the shape of an elongated *nitida*, that is to say, far more triangular in contour, and far more attenuated posteriorly than in *nucleus*. Its valves are strong and are more compressed than in either of the shells referred to. From the former of them its scarcely glossy epidermis (the olivaceous hue of which is modified in different individuals by tints of yellow-brown or even green), from the latter the chestnut rays which adorn the exterior and vary as to width and number (sometimes there are additional radiating lines of an iron-grey, and occasionally these alone are present) effectually distinguish it. In all stages of growth it preserves its peculiar distinctive features. The swell of the ventral margin is more gradual than in *nucleus*, its posterior dorsal slope more considerable; its internal nacre of a less blue cast and rather more iridescent, and its teeth are in general not quite so elongated. In other respects our description of *nucleus* is equally applicable to the present species. It exceeds that shell however in dimensions, as it attains to at least five-eighths of an inch in length, and nearly half an inch in breadth. When of these dimensions, the front declination is so abrupt (and almost rectilinear) that the beaks are all but perfectly terminal.

The remark made respecting the animal of *Nucula nitida* equally applies to this.

This species is probably widely distributed, but having been usually confounded with *nucleus*, it is difficult to ascertain its precise range. Certain localities are South Devon, Torbay (Alder and S. H). Milford Haven, in ten fathoms, always in separate parts of the bay from *nucleus* (M'Andrew and E. F.) ; Lundy Island, seven to twenty-five fathoms in sandy-gravel (M'Andrew). Lamlash, Arran (Alder) ; and, probably, Exmouth (Clark). Mr. M'Andrew has taken this form at Gibraltar.

### N. DECUSSATA, Sowerby.

Solid, decussated ; hinder dorsal area barred with wavy pliciform wrinkles.

Plate XLVII. fig. 1, 2, 3.

*Nucula decussata*, SOWERBY, Concholog. Illust. Nucula, No. 27, fig. 18.—HANL. Recent Shells, vol. i. suppl. pl. 20, f. 8.

„ *sulcata*, BRONN, Italiens Tertiar-gebild. p. 109 (inadequately).—PHILIPPI, Moll. Sicil. vol. ii. p. 45; Wiegmann's Archiv. Naturg. 1845, p. 192, pl. 7, f. 24, 25.

„ *Polii*, PHILIPPI, Moll. Sicil. vol. i. p. 63, pl. 5, f. 10.—JEFFREYS, Ann. Nat. Hist. vol. xix. p. 313.

The general aspect of this shell is not unlike that of *nucleus*, to which its outline is very similar. It resembles that shell much more nearly than it does either *nitida* or *radiata*, owing to the existence of an anterior side, the beaks being far less nearly terminal in the present than in the three preceding species. It is, however, slightly more elongated, rather more tapering behind, and has the base of the anterior side somewhat more prominent, in consequence of the less abrupt slope of the front margin. It is a solid, and occasionally (for its size) even a heavy shell, never rayed with coloured streaks, but covered with an epidermis of a dirty or greenish oil colour. The surface, except upon the dorsal areas, is closely and finely decussated by raised radiating striulæ and rather irregular elevated concentric wrinkles; which latter are most perceptible towards the base and sides, being sometimes almost obsolete upon the central disk. The lunule is large, pouting, and well defined by that abrupt cessation of convexity, which preceding the retusion that bounds it, more or less sharply angulates the shell. The hinder dorsal area is rather flattened, and is transversely corrugated by rather closely disposed pliciform wrinkles, which are not at all oblique, and are always more or less undulated. Similar, but more interrupted or even subgranose ones, usually adorn the lunule likewise. The umbones are moderately prominent, and are placed at nearly one-third the distance from the anterior extremity; they are frequently eroded in the adult examples. The internal nacre is pearly white; the margin crenulated within; the cartilage small; the hinge-margin by no means broad, and furnished with about twelve teeth in front and twenty-four behind, none of which are especially elongated. This proportion of front and hinder teeth appears to be very general in the *Nuculæ*.

For its genus, it must be regarded as a large shell, one of our examples measuring five-eighths of an inch in breadth, and all but four-fifths of an inch in length.

The animal appears to resemble closely that of *nucleus*.

This fine and very distinct species was announced as British by Mr. Jeffreys, in the nineteenth volume of the

"Annals of Natural History." Although an inhabitant of the deeps of the Mediterranean, it is probably a *Nucula* of northern origin. On our coasts it has been taken alive in thirty and forty-five fathoms, dark muddy bottom, off Raza in the Hebrides, and north of that island in one hundred and fifty fathoms, but dead; also in one hundred fathoms in Loch Fyne (M'Andrew and E. F.). Mr. Barlee has taken it at Oban, and at Tarbert in Loch Fyne. Mr. Clark and Mr. Warren have taken it in Dublin Bay, and it has been also dredged on the south-west coast of Ireland (M'Andrew).

Lovèn records it as a Swedish shell. It occurs fossil in the Pleistocene Tertiaries of Italy, and living at great depths in the Ægean.

### N. TENUIS, Montagu.

Abbreviated-ovate, fragile, compressed; inner margin not crenated.

Plate XLVII. fig. 6, and (Animal) plate P. fig. 5.

*Arca tenuis*, MONT. Test. Brit. Suppl. p. 56, pl. 29, f. 1.—TURT. Conch. Diction. p. 11. — DILLWYN, Recent Shells, vol. i. p. 246. — Index Testaceolog. pl. 10, Arca, f. 45.

*Nucula* „ TURT. Dithyra Brit. p. 177. — FLEM. Brit. Anim. p. 402. — MACGILLIV. Moll. Aberd. p. 244. — Brit. Marine Conch. p. 105. — BROWN, Illust. Conch. G. B. p. 85, pl. 33, f. 13.—GOULD, Invert. Massach. p. 105. — HANL. Recent Shells, vol. i. p. 171, pl. 10, Arca, f. 45.

*Nucula tenera* (fossil), WOOD, Mag. N. Hist. 1840, pl. 14, f. 2.

This, by far the most fragile and depressed of our British *Nuculæ*, is also less triangular in its outline than the mass of its congeners, having its contour, which varies greatly in extent of obliquity, of a more or less abbreviated ovate form. Its valves are much compressed, thin, brittle, and almost semitransparent, smooth, with the exception of the presence of a few growth lines, and covered with a highly lustrous epidermis, which varies in hue from olivaceous yellow to yellowish drab or ash colour, but is not rayed or variegated in any individuals we have met with. The sides are, as usual, extremely unequal, and the ventral edge, which is not crenated internally, greatly arcuated. The anterior edge is more or less straight and abrupt; the hinder edge at first rather ascends than declines, so that a more or less subangulated curve prevents a continuity and abruptness in the slope; hence the posterior termination is not subcuneiform, or much attenuated, but simply, though not broadly, rounded. The greatest breadth of the shell is a little before the middle, and not immediately behind the umbones. The hinder dorsal area is not flattened, so that the lips project rather than incurve; there is no sculpture either there or on the site of the lunule, which latter is but seldom at all defined. The umbones are not prominent; the beaks are small, but acute and distinct. The internal nacre is silvery white, and in general not remarkably brilliant; the edge is entire; there are about six teeth before the cartilage-pit (which is extremely oblique), and fifteen behind it. The Greenland specimens are described by Möller as having twelve anterior and sixteen posterior teeth! (Ind. Moll. Groenl., p. 17.) One of our larger examples measured four-tenths of an inch in length, and one-fourth less in breadth. The younger individuals are more elongated in proportion.

The animal is white: the margins of its mantle are quite free in front and posteriorly, and simple at edge. The foot is white, rather more elongate, and not so markedly pedunculated as in the other British *Nuculæ*, nor are the margins of its disk so coarsely serrated; crenations are, however, more numerous.

This is essentially a Northern species, and common only on the coasts of Scotland, and the north-east of England. It inhabits deep water on muddy or sandy bottoms, and is a favourite food for haddocks. The most southern locality of which we have a note is "Tenby," communicated by Mr. Jeffreys, on the authority of Dr. Goodall. The only other English localities are Scarborough (Bean), and the coast of Northumberland, where it is frequent in the coralline zone (Alder). In Scotland it occurs in the Clyde district, and the Hebrides in many localities, where we have taken it alive in depths from forty to one hundred fathoms: also in Zetland in sixty and eighty fathoms (M'Andrew and E. F.)

The more trigonal and convex variety has been taken by Mr. Jeffreys in one hundred fathoms, fifty miles east of Lerwick, and ten miles from the same part of Zetland in fifty fathoms. "Alive in forty fathoms, fine sand, about five miles off the Ord Head, Caithness, associated with *Virgularia*, *Solen pellucidus*, *Montacutæ*, *Lucina flexuosa*, &c" (Thomas). Capt. Laskey found it off the entrance of the Frith of Forth in considerable numbers. In Ireland it has been taken at Portmarnock, near Dublin, by Mr. Warren.

This shell appears first as a fossil in the red crag, and occurs in the mammaliferous crag of Southwold (S. V. Wood), and the pleistocene beds of the Clyde (Smith), and Ireland (E. F.). It distribution as a living species is extensive, ranging through the Boreal and Arctic seas, and round to the coasts of Massachusetts.

### LEDA. Schumacher.

Shell equivalve, inequilateral, oblong, produced posteriorly, closed, smooth or concentrically striated, invested by an epidermis; margins smooth; beaks approximated, incurved; inside more or less nacreous; hinge-line angulated and formed, as well as the ligament, as in *Nucula*. Pallial impression with a sinus.

Animal oblong; mantle open in front, with simple or fimbriated margins, furnished posteriorly with two partially united slender unequal siphonal tubes. Foot and palps like those of *Nucula*.

The propriety of separating this group of bivalves from *Nucula* was first shewn by the lamented author of the "Index Molluscorum Groenlandiæ," who, after having discovered the peculiarities of the animals, adopted the genus as empirically proposed by Schumacher. It is singular that the sinuated pallial impression, indicative of the presence of siphonal tubes, had previously escaped notice. *Leda* is one of several instances which go to shew the fallacy of separating the lamellibranchiate bivalves into great sections on account of the presence or absence of siphons. The genus ranges far back in time, and its species exhibit similar habits with those of *Nucula*.

#### L. caudata, Donovan.

Surface girt with raised concentric striæ.

Plate XLVII. fig. 11, 12, 13, and (Animal) plate P. fig. 2.

*Arca minuta*, O. Fabricius, Fauna Groenlandica, p. 414? — Mont. Test. Brit. p. 140.—Maton and Rack. Linn. Trans. vol. viii. p. 92.—Dorset Catalog. p. 36, pl. 1, f. 16. — Turt. Conch. Diction. p. 11, f. 98. — Dillw. Recent Shells, vol. i. p. 245. — Index Testaceolog. pl. 10, Arca, f. 44.

*Arca caudata*, Donov. Brit. Shells, vol. iii. pl. 78.
*Nucula minuta*, Turt. Dithyra Brit. p. 178. — Flem. Brit. Anim. p. 402. — Macgilliv. Moll. Aberd. p. 245.—Brit. Marine Conch. p. 106. — Brown, Illust. Conch. G. B. p. 84, pl. 33, f. 18. — Hanl. Recent Shells, vol. i. p. 168, pl. 10, Arca, f. 44. — (No. Philippi, Moll. Sicil.; scarcely Gould, Invert. Massach.).
„ *rostrata*, Macgilliv. Moll. Aberd. p. 245 (not Montagu).
*Leda minuta* (and *complanata*), Möller, Index Moll. Groenl. p. 17 ? — King, Ann. Nat. Hist. vol. xviii. p. 240.
„ *caudata*, Lovèn, Index Moll. Skandinav. p. 34 (probably).

Of the two very distinct forms of this graceful shell, that which we regard as the typical one is oblong-lanceolate in shape, compressed at the longer side, and but little convex at the other; the central disk is not, however, particularly shallow. The valves are decidedly inequilateral, opaque, moderately strong, and covered with a rather dull epidermis of a yellowish or pale olive-green; their surface is adorned with numerous regular concentric delicate lyræ (or raised striæ), which are much narrower than their simple interstices. These striæ, which vary much in strength and distance, are sometimes much elevated, sometimes rather depressed. This sculpture uninterruptedly and almost evenly occupies the entire exterior, the lunule and the immediate vicinity of the opposite dorsal suture alone excepted. The ventral edge is gently arched at the shorter side, where its upward sweep exceeds the descending curve of the dorsal margin, which it surpasses, or at least vies with in convexity; hence causing the most projecting portion of that side to lie either in the middle or above it, and the tapering but rounded extremity to become occasionally a little angulated. It is straighter at the longer side and by its ascent (through trifling), and by its slight subterminal retusion, assists the incurved and but moderately sloping dorsal edge in forming a rather long subcentral rostrum, which latter is much attenuated, and somewhat squarely truncated at the tip. The lunule is large, concave (but with pouting lips), spindleshaped, and devoid of all sculpture; it is well defined by the sharply angulated upper edge of the flattened umbonal fold, which likewise exhibits an angulation, though a less marked one, at its lower edge, where its bounds are clearly indicated by the abrupt flexure of the girding lyræ. The beaks which are situated at about three-sevenths of the distance from the rounded extremity are acute, prominent, and only slightly inclined to the longer side. The inside is of a polished white (not nacreous) which has almost invariably a bluish cast; the cartilage-pit is appressed; there are about eighteen vaulted spinous teeth on the longer side, and about sixteen on the other; the margin is quite plain.

The other (or northern) variety, generally a smaller shell, being of a more convex and abbreviated shape, has consequently its lower margin more arched, and its rostrum more sudden in formation. Some very delicate and obscure radiating lineoles are almost invariably perceptible; the sides are also more unequal; and the striæ, which are usually finer and more crowded, do not quite extend to either extremity. In the more characteristic examples, the swell of the ventral edge is very unequal, and not gradual as in the typical variety. Were these features permanent in every individual, they might be probably estimated as of specific importance; but as we have examples before us which unite the exact shape of the previous form, to the radiating lineoles, &c., of this one, we cannot venture to consider the two shells as more than varieties of the same species.

The length of a large specimen was two-thirds of an inch; its breadth was four lines and a half: the ordinary size of individuals is rarely above half an inch long, and rather more than half that measurement broad.

The description by Fabricius of his *Arca minuta*, drawn up solely from two engorged, and probably eroded, individuals, fairly enough agrees, except in the number of teeth, with our British species ; the shell, however, identified with it by the Northern conchologists, who naturally have better data for determining the Boreal species, than we possess, is allied, but very distinct.

Animal of a white colour, oblong and pyriform ; the margins of the mantle are freely open except posteriorly, and are fringed or denticulated by a series of five very short filaments. The siphons are united for more than half their lengths, considerably prolonged, slender and smooth : the branchial one is shorter than the anal, and the latter has a quadrangular orifice with apiculated angles. The foot is oblong, compressed, white, deeply grooved, and capable of expansion into a creeping disk, with crenated margins.

This species, though found in the south, is rare there, and becomes plentiful only on our northern coasts. Herm, Sandwich, Weymouth, but scarce (S. H.) ; Exmouth, in twenty fathoms, very rare (Clark) ; Tenby (S. H.) ; Fishguard (Jeffreys) ; ten fathoms, Milford Haven, twenty-five fathoms Anglesey, and fifteen to twenty fathoms, gravel, Caernarvon Bay (M'Andrew and E. F.) ; Scarborough (Bean) ; from deepest water, frequent on the coasts of Northumberland and Durham (Alder) ; throughout the Hebrides and Clyde district in various depths of water, from fifteen to ninety and one hundred fathoms. Off the Mull of Galloway (Beechey) ; and Sana Island (Hyndman) ; in deep water on the East coast from the Dudgeon to Orkney (Thomas).

The longer beaked variety occurs on both sides of Scotland, as in Loch Fyne (Barlee); and Aberdeen (Macgillivray).

This shell ranges through the Scandinavian and Arctic Seas, and is found fossil in our Pleistocene strata, but not commonly, and occurs in the red crag of Sutton (S. V. Wood).

### L. PYGMÆA, Munster.

Minute; surface quite smooth.

Plate XLVII. fig. 10, and (Animal) plate P. fig. 3.

*Nucula pygmæa*, MÜNSTER in Goldfuss. Pet. Germ. pl. 125, f. 17 (fossil).—PHILIPPI, Moll. Sicil. vol. ii. p. 46 (fossil).—S. WOOD, Mag. Nat. Hist new series, vol. iv. p. 298, pl. 14, f. 7 (fossil).
„ *tenuis*, PHILIPPI, Moll. Sicil. vol. i. p. 65, pl. 5, f. 9 (fossil).
„ *gibbosa*, SMITH, Wern. Mem. vol. viii. pl. 2, f. 10 (fossil).
„ *lenticula*, MÖLLER, Index Moll. Groenlandiæ, p. 17 (from types).
*Leda pygmæa*, FORBES, Mem. Geolog. Survey, vol. i. p. 419.
„ *tenuis*, JEFFREYS, Annals Nat. Hist. vol. xix. p. 313.
*Yoldia pygmæa*, LOVÈN, Index Moll. Skandinav. p. 35.

This minute shell, one of the more recent additions to our Fauna, was first incidentally recorded as a living inhabitant of our seas in the " Memoirs of the Geological Survey of Great Britain."

It is of a triangular-oval shape, subequilateral, more or less ventricose (especially near the umbones), not particularly thin, quite smooth, and covered with a very pale yellowish olive-coloured and highly lustrous epidermis. The ventral margin is gently but decidedly arcuated, ascending in a convex line at both extremities, but rather the more so at the longer side, with whose upper edge it forms a short and subrostrated extremity, of which the tip is bluntly acuminated. This portion is not beaked in the young, but simply attenuated and rounded. The extremity of the opposite side, which is rather the shorter and somewhat tapering, is unsymmetrically rounded; the upper edge, except near the very prominent umbones, is convex and moderately sloping. The declination of the other dorsal edge is likewise but moderate, its general inclination is retuse; in the young, however, it is even slightly convex. The beaks are small and inflected, scarcely inclining to the longer side. There is not even a rudimentary lunule, and the opposite dorsal area is neither impressed nor flattened. There are about a dozen teeth on each side of the hinge-margin; the cartilage pit is very small: the inner margin quite entire.

Few specimens much exceed a fifth of an inch in length, and a full eighth of an inch in breadth.

The animal is of a pale fawn-white colour. The margins of the mantle are freely open in front, closed posteriorly to form a short tube consisting of the united siphons, of which the branchial appears shortest: the orifices of both are plain. The foot is hatchet-shaped and wide-grooved at its posterior edge, to form an expanded and crenated disk.

The discovery of this interesting little *Leda* as a living inhabitant of the British seas, is due to Mr. M'Andrew, who dredged it first in the Sound of Skye on a muddy bottom, twenty-five to forty fathoms deep; off Croulin Island in thirty fathoms; and in fifty fathoms in the Minch. It has since been taken off Skye by Mr. Jeffreys and at Portree, Mr. Barlee, and by the latter gentleman at Stornoway in the Outer Hebrides.

Lovèn finds it on the Scandinavian Coast from Bohuslan to Finmark; and Möller, who first noticed it as a living species, discovered it in the Greenland Seas. As a fossil it has been better known; occurring in the Newer Pliocene of Sicily, and other places abroad, and in the Clyde Pleistocene beds, where it was observed by Mr. Smith of Jordan-Hill.

### SPURIOUS.

### L. Montagui, Gray.

*Arca rostrata*, Mont. (not Chemn. Dillw. nor Brug.) Test. Brit. Suppl. p. 55, pl. 27, f. 7.—Turt. Conch. Diction. p. 11.
*Nucula* „ Turt. (not Lam.) Dithyra Brit. p. 178.—Flem. Brit. Anim. p. 402.— Brit. Marine Conch. p. 106.— Brown, Illust. Conch. G. B. p. 84, pl. 33, f. 16.—Hanl. Recent Shells, vol. i. p. 168, suppl. pl. 20, f. 1.
„ *Montagui*, Gray, Ann. Philosoph. 1825, p. 138.
„ *curvirostra*, Sowerby, Concholog. Illustr. Nucula, f. 5.—Reeve, Conch. Systematica, pl. 85, f. 5.
„ *recurva*, Conrad, Journ. Acad. Nat. Sci. Philadelphia, vol. vi. pt. 2, p. 262, pl. 11, f. 21.—Hanl. Recent Shells, vol. i. p. 170.

*A native of Liberia, &c.; introduced by Montagu, as dredged in Scotland off St. Abb's Head, by Mr. Laskey. Probably from ballast.*

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In consequence of the Pleistocene Tertiary beds of clay on the west coast of Scotland being often laid bare below low-water mark, fossil shells are frequently brought up in the dredge along with recent ones, and as often cast on the shore. Owing to their extremely fresh aspect, even the epidermis in many instances being preserved with its pristine colours and lustre, it is very difficult to say at a glance whether such specimens be not the exuvia of animals yet living in the neighbourhood. This difficulty is yet further increased by the possibility which always exists of the species in question yet lingering alive (as indeed we have seen in the case of *Leda pygmæa*), in some limited tract or Boreal patch in our seas. Until, however, such is proved to be the case, we cannot admit well known and characteristic drift species into our list of living forms, and in this category we must place *Leda oblonga* (*Nucula oblonga*, Brown, Ill. Conch. G. B. p. 84, pl. 33, f. 1) and *Leda truncata* (*Nucula truncata*, loc. cit., p. 84, pl. 33, f. 1), both of which are, however, still found living in Arctic regions.

## ARCA. Linnæus.

Shell more frequently equivalve, more or less inequilateral, closed or gaping in front, more or less quadrate, usually solid, almost always radiatingly ribbed or striated, covered with an epidermis, which is in most instances loose and rough; margin smooth or crenate; beaks remote, separated by a tetragonal grooved ligamental area. Hinge straight or nearly so, consisting of small interlocking teeth, parallel in the centre, oblique at the sides: ligament external. Pallial impression entire, muscular scars very marked, and sometimes ledge-shaped.

Animal oblong, mantle freely open, simple or fringed; no siphons. Foot large, oblong, bent, grooved throughout its length, so as to form a disk with plain or slightly crimped margins; a byssal gland at its base. Byssus compact. Mouth surrounded by labia formed out of the extremities of the branchiæ; no true palps.

The Arks, so called from their boat-like shapes, are mostly dwellers in crevices of rocks and cavities of shells, moored by their powerful byssus, but can equally live free. They are found in all depths of water, though the majority of species are littoral. The genus has most representatives in the Tropics. M. Nyst, who has recently catalogued both the existing and extinct forms of *Arca*, enumerates nearly

460 species. They range in time as far back as the Silurian epoch. We regard *Cucullæa* and *Byssoarca* as scarcely sections of the genus.

### A. TETRAGONA, Poli.

More or less stained with brown; umbonal ridge sharply angulated: ligamental area rhomboidal.

Plate XLV. fig. 9, 10, and (Animal) plate P. fig. 1.

? *Arca tortuosa*, PENNANT (not Linn.), Brit. Zool. ed. 4, vol. iv. p. 97.

„ *Noæ*,* MONT. (not Linn.), Test. Brit. p. 139, pl. 4, f. 3.—DONOV. Brit. Shells. vol, 5, pl. 158, f. 1, 2. — COUCH, Cornish Fauna, pt. 2. p. 30.—BROWN, Ill. Conch. G. B. p. 86, pl. 33, f. 1, 2, 3.

„ *fusca*, DONOVAN (not Brug.), British Shells, vol. v. pl. 158, f. 3 (not 4). — MONT. Test. Brit. Suppl. p. 51. — TURT. Conch. Diction. p. 10; Dithyra Brit. p. 166. — FLEMING, Brit. Anim. p. 397. — COUCH, Cornish Fauna, pt. 2, p. 30. — Brit. Marine Conch. p. 101.—BROWN. Ill. Conch. G, B. p. 86, pl. 33, f. 4, 5.

„ *tetragona*, POLI, Test. Siciliæ, vol. ii. p. 137, pl. 25, f. 12, 13. — TURT. Dithyra Brit. p. 166, pl. 13, f. 1. — FLEMING, Brit. Anim. p. 398. — FORBES, Malac. Monensis, p. 41, pl. 3. — Brit. Marine Conch. p. 102. — BROWN, Ill. Conch. G. B. p. 86, pl. 33, f. 20, 21.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 461. — PHILIPPI, Moll. Sicil. vol. i. p. 57. — HANL. Recent Shells, suppl. pl. 19, f. 13. — REEVE, Conch. Iconica, Arca, pl. 15, f. 100.

„ *imbricata*, DILLWYN (not Brug.), Recent Shells, vol. i. p. 226 (chiefly).

„ *Cardissa*, LAMARCK, Anim. s. Vert. (ed. Desh.) vol. vi. p. 463.—ALDER, Cat. Moll. Northumb. and Durh. p. 79. — DELESSERT, Recueil Coq. Lam. pl. 11, f. 14. — HANL. Recent Shells, vol. i. p. 153.

„ *papillosa*, BROWN, Wern. Mem. vol. viii. pl. 1, f. 19.

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* The *Arca Noæ* of Dr. Turton, with "chestnut bands crossing the valves diagonally" (Conch. Diction. p. 9, and Dithyra Brit. p. 166.—FLEM. Brit. Anim. p. 397.—Brit. Marine Conch. p. 101), is not identical with this shell, but agrees rather with the veritable *Noæ* (POLI, Test. Sicil. vol. ii. p. 128, pl. 24. — DESH. Exp. Sc. Algiers, Moll. pl. 120, anatomy) of Linnæus, whose description in the "Museum Ludovicæ Ulricæ" is reprinted *verbatim* by Maton and Rackett, in their "Descriptive Catalogue of British Shells" (Linnæan Transactions, vol. viii. p. 91). It is not indigenous.

*Arca navicularis*, DESH. (not Brug.) Anim. s. Vert. (ed. Desh.) vol. vi. p. 462. —PHILIPPI, Moll. Sicil. vol. ii. p. 42.
„ *Britannica*, REEVE, Conch. Icon. Arca, pl. 15, f. 98.
„ *rhombea*, COUCH, Cornish Fauna, pt. 2, p. 31.

It is but rarely that we meet with this *Arca* in fine and perfect condition; much more frequently it occurs only in single valves, or, from the nature of its dwelling-place, with a considerable portion of its surface abraded. In this last state it has been separated by Turton from its more typical form (the *fusca* of Donovan) under the name *tetragona*; whilst aged and worn examples have been confounded with the true *Noæ* by Montagu and Donovan.

Its valves, which, although broad across the umbones, where the surface is much flattened, rapidly diminish in convexity, are of an elongated subrhombic shape, strong and opaque, devoid of lustre, and of equal size and profundity. They are of a warm rufous brown or reddish chocolate colour, with the colouring matter not evenly diffused, but wholly or partially absent near the front of the shell, and disposed in darker concentric zones upon the hinder portion. In the more beautiful specimens the anterior third is almost white, with, however, a more or less distinct radiating brown stain in front. The surface is everywhere adorned with most closely arranged radiating costellæ, which are decussated by still more closely-set concentric and somewhat imbricated granules: the interstices of the costellæ, which are of equal size throughout the entire exterior (the few, however, which immediately follow the umbonal keel become changed into radiating striæ), are so narrow, except near their termination, as almost to be linear, and are clothed with a brownish and somewhat squamular epidermis. The umbonal ridge is sharply angular, and upon its crest the decussation becomes almost squamular, and the epidermis of an increased length; the triangular area beyond it is concave and narrow, and the terminal costellæ lie rather further apart than the rest. The anterior side is decidedly short, its upper corner is angular (the angle is generally almost a right one), the lower extreme of it is obliquely rounded, the inclination of both anterior and posterior edges being oblique and backward. The hinder termination is biangulated, the upper corner being an obtuse, the lower an acute, angle. The ventral margin usually displays but little hiation in the young, wherein it is usually nearly rectilinear, but in the more aged individuals the gape is often of extreme magnitude; in both the inclination is almost rectilinearly ascending at the longer end. The ligamental area is more or less concave, although projecting a little at the suture: it is of a pale buff colour, so lineated with brown as to form closely disposed obtuse angles at the suture: the actual area occupied by the brownish ligament is small and rhomboidal in outline: in the younger examples it distinctly exhibits an intervening central space, which diminishes in its relative proportion as age advances. The beaks are acute, very far apart, and much inclined. The interior is white, or faintly stained with the external colouring: the teeth of the shorter portion of the hinge-margin are oblique, and rather large; upon the longer side they are more numerous and crowded, less oblique, and more curved.

We have examined British specimens of this species alive, and have had the benefit of ample notes on its structure by Mr. Clark and a drawing of it, which we engrave, by Mr. Alder.

The animal is shaped as the shell, and of a firm substance; its mantle is open throughout with plain margins, except at the posterior extremity where they are dentated. There are no siphons, but temporary openings can be formed by bringing together the edges of the mantle-lobes in the branchial and anal regions. The mantle varies in colour, either white or brownish or orange or yellow, and has about forty equidistant black dots, obsolete anteriorly, ranged along its edge. The foot is long, narrow, geniculated towards its base, and deeply-grooved, so as to form a disk throughout its length, especially in the region of the byssal groove: it is usually, as well as the body, of a flesh-colour, sometimes yellowish-white. The byssal groove is ample and forms a mould for the filamentous matter, which is cast in shape of a thin cup-shaped membrane, eventually forming a thick and firm brown operculum, which on being closely examined is found to consist of the combined byssal threads. This operculum can be cast off and reformed with great rapidity. The branchiæ are brown, long, and narrow; their outer surfaces are less striated than the inner. "There are no palps, strictly so called; but the linear branchiæ, without terminating as usual, are continued in the same narrow form around the buccal orifice, and meet with their fellows on the other side, and thus form a pair of true labia, rather than palpi" (Clark).

This fine Ark was once esteemed a very rare British shell, but has of late years been found in numerous localities all round our coasts. It is taken in crevices of rocks, in chinks of old shells, in the interior of dead shells, and sometimes quite free; when found in confined localities it is often much distorted, but free specimens are very regular. It is most abundant on the south-west coast of England, the south and west of Ireland, and off the Zetlands. The following selected localities will illustrate its range, in the living state: Herm, near Guernsey, on dead oysters (S. H.); Exmouth on oysters from deep water (Clark); in crevices of rocks, Falmouth (Cocks); Penzance, in twenty fathoms

(M'Andrew and E. F.); Fishguard, in twenty fathoms (Jeffreys); and off Lundy Island, in twenty-seven fathoms (M'Andrew); Isle of Man, in twenty-five fathoms (E. F.); frequent in cavities of stones and shells from deep water, north of Northumberland (Embleton); rare at Scarborough (Bean); Berwick (Johnston); thirty-five fathoms, Buchanness, and Staples; seventeen fathoms, Eda Sound, Orkney (Thomas); twelve fathoms, Orkney; Zetland, in twenty-five and fifty fathoms, and off Cape Wrath, in fifty-five fathoms (M'Andrew and E. F.).

### A. LACTEA, Linnæus.

White; umbonal ridge blunt; teeth numerous.

Plate XLVI. fig. 1, 2, 3.

LISTER, Histor. Conch. pl. 235, f. 69.

*Arca lactea*, LINN. Syst. Nat. ed. 12, p. 1141.—DA COSTA, Brit. Conch. p. 171, pl. 11, f. 5.—DONOV. Brit. Shells., vol. iv. pl. 135.—MONT. Test. Brit. p. 138. — MATON and RACK. Trans. Linn. Soc. vol. viii. p. 93. — Dorset Catalog. p. 36, pl. 11, f. 5. — FLEMING, Brit. Anim. p. 398.—Brit. Marine Conch. p. 102.—BROWN, Ill. Conch. G. B. p. 86, pl. 33, f. 6. — DILLWYN, Recent Shells, vol. i. p. 236. — LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 467. — MAWE, Linn. Syst. Conch. pl. 13, f. 4. — COSTA, Cat. Test. Siciliæ, p. 46. — PHILIPPI, Moll. Sicil. vol. i. p. 57, and vol. ii. p. 42. — HANL. Recent Shells, vol. i. p. 154, pl. 9, Arca, f. 24. — REEVE, Conch. Iconica, Arca, pl. 17, f. 116.

" *barbata*, PENNANT (not Linn.), Brit. Zool. ed. 4, vol. iv. p. 98, pl. 58, f. 59.

" *modiolus*, POLI, Test. Siciliæ, vol. ii. p. 137, pl. 25, f. 20, 21. — COSTA, Cat. Test. Siciliæ, p. 45.

" *crinita*, PULTENEY, Hutchins, Hist. Dorset, p. 35.

" *perforans*, TURT. Conch. Diction. p. 9; Dithyra Brit. p. 169, pl. 13, f. 2, 3.

" *Gaimardi*, PAYRAUDEAU, Cat. Moll. Corse, p. 61, pl. 1, f. 36 to 39.— DESH. in Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 476. — COSTA, Cat. Test. Siciliæ, p. 46. — HANL. Recent Shells, vol. i. p. 155.—DESH. Exp. Sc. Algiers, Mollus. pl. 124, f. 8 to 11.

" *Quoyi*, PAYRAUDEAU, Cat. Moll. Corse, p. 62, pl. 1, f. 40 to 43.

As Dr. Philippi correctly observes, this is a peculiarly variable shell, the chief difference of contour being effected by the convexity or straightness of the hinder margin. Individuals of the former shape (var. *Quoyi*), are generally more compressed when young, are more or less distinctly biangulated posteriorly, and have their radiating striæ finer and more closely disposed; examples of the latter form (var. *Gaimardi*) are usually more abbreviated in shape, and have their beaks more approximate, their epidermis more copious and of a softer texture. The valves which are opaque, strong, equal, and subrhomboidal in contour, are ordinarily ventricose in the adult, with their convexity tolerably evenly diffused, and become more or less flattened, but not concave, beyond the obtuse umbonal ridge. The entire surface, which beneath the pale or yellowish brown and somewhat squamose epidermis, is of a dull squalid white or light buff colour (dead valves are snow-white) is closely radiated with most numerous raised subgranulated striæ, which are slightly stronger at both extremities, and decidedly more distant behind. Their interstices are either narrower or scarcely broader than these costellar striæ, and are devoid of any radiating transverse striulæ, but occasionally reticulated from the lateral projection of the granules. The anterior side, although decidedly the longer, is not very greatly so, its extremity is rounded below, and a little angular above; the hinder termination is more or less biangulated. The dorsal and ventral edges are nearly parallel; the latter rises rather the more in front of the shell. The cardinal area is much sunken, not variegated, rather narrow, and of no great extent; the ligament itself is oblong-lanceolate, dusky, and marked throughout with most delicate striulæ, which run parallel to each other between the scarcely inclined and not very distant beaks. The umbones are prominent. The interior is of an uniform white, and its margin is quite free from crenation; the hinge-margin increases greatly in breadth at both ends, its lower edge is incurved, and the teeth, which are rather numerous, enlarge considerably and nearly equally at both ends.

Our largest specimen only measures three-quarters of an inch in length and half an inch in breadth.

The animal, according to Mr. Clark, is oblong, thick, body white, mantle pale red towards the apex, entirely open, having the under surface of the ventral range marked on a very pale yellow ground with irregular fleshy blotches, and on the upper for some little depth with a sand-like rusty brown margin, and a darker interrupted bordering line near the slightly dentated edge. There are no equidistant black points or ocelli as in *Arca tetragona*. The foot is white with a deep fissure at its bend, and is usually provided with a green byssal membrane by which it is attached to various substances, from which, however, the animal can freely cast itself off and spin a new byssus. Even when fixed the foot can be protruded for a considerable length, and it then appears fleshy and tapering, and of a pure white colour. On each side of the body are two very thin narrow symmetrical pale brown branchiæ, gradually tapering on each side, uniting around the mouth, and forming, instead of palpi, a double lamina or lip.

This little Ark is, in the main, a southern species. It occurs at Herm and elsewhere in the Channel Islands, profusely attached to dead bivalves (S. H.); Portland Island in fifteen fathoms, occupying the crevices of shells, Penzance in twenty fathoms (M'Andrew and E. F.); Shelborne, Sandwich, Whitesand Bay, Ilfracombe, Fishguard in twenty fathoms, and Manorbeer, in Pembrokeshire (Jeffreys), Exmouth (Clark and Jeffreys), Tenby and Milford Haven (Lyons), Lundy Island in seven to twenty-seven fathoms (M'Andrew), off the Norfolk coast (Captain Owen Stanley), Filey in Yorkshire (Strickland), Berwick Bay (Dr. Johnston), Ireland (Mr. Dillwyn), Bantry Bay (Mrs. Puxley).

It is common in seas to the south of Britain, and abundant in the Mediterranean.

### A. RARIDENTATA, Searles Wood.

Very small, white; posterior end greatly the broader: hinge with only three or four teeth on either side of the beak.

Plate XLV. fig. 8.

*Arca raridentata*, SEARLES WOOD, Charlesworth's Magaz. Nat. Hist. vol. iv. (1840), p. 232, pl. 13, f. 4 (fossil). — THOMPSON, Annals Nat. Hist. vol. xviii. p. 385.

*Arca Pectunculoides*, "SCACCHI, Notizie, etc. p. 25, no. 62, pl. 1, f. 12," (Philippi). — JEFFREYS, Ann. Nat. Hist. vol. xix. p. 313. — PHILIPPI, Moll. Sicil. vol. ii. p. 44, pl. 15, f. 8. —LOVÈN, Index Moll. Scandinav. (from specimens.)

The general aspect of this elegant little *Arca* is rather peculiar, inasmuch as the radiating ribs, so universal in the recent species of this genus, are either almost absent or barely indicated; and the shape, which is nearly semicircular, but of great disparity in breadth at the two extremities, is far from an ordinary one. The valves, which are tolerably strong, almost opaque, and very nearly equal to each other in size and depth, are swollen at the umbones, from whence they diminish in convexity in nearly equal ratio on either side. They are of an uniform whitish hue, both within and without, and are decussated by fine close-set lamellar concentric striæ, and still more delicate radiating striulæ, the former being chiefly evident at the umbones, the latter at the sides, and towards the lower margin of the shell. The straight dorsal margin is very nearly equal in length to the ventral, which latter is greatly arcuated, and ascends so remarkably, yet in a convex line, in front of the shell, as to excise, as it were, the lower anterior corner, and more or less sharply angulate the upper one. The posterior termination is broad, well rounded below, and above forms a more or less distinct obtuse angle; the hinder edge, and particularly its lower portion, curves outwards. The umbones are prominent; the beaks, which are small, and not much inclined, are approximate, the cardinal area being extremely narrow. There is no angulation of the umbonal ridge, nor any concave area behind it. The interior is of an uniform white; the hinge teeth, of which none exist in the middle part of the margin, only number three or four in front, and three behind: the latter are peculiarly oblique, the former decidedly large for the size of the shell. The internal margin is not distinctly crenated, but some obscure crenæ occasionally appear at the narrower extremity. From the minute size of the species, the epidermidal covering is not very distinct; it seems, however, of a brownish ash-colour, and not pilous, but membranaceous. Our largest specimen only measures about two lines at the broadest part, and is rather more than the fifth of an inch in length.

The animal is of a white colour: otherwise unknown.

The *Arca raridentata* was first discovered in a living state by Mr. M'Andrew, who dredged it in the Minch fifty miles from the Shiant Isles, among the Hebrides, in fifty fathoms on a bottom of sandy gravel, and afterwards twenty miles off the west of Zetland in sixty fathoms, and near Foula in forty-five. Mr. Jeffreys has taken it in forty fathoms off Skye, and Mr. Barlee in the outer Hebrides. Far apart from these localities for this rare shell is Cape Clear, the southern extremity of Ireland, off which it has been dredged by Mr. M'Andrew in sixty fathoms.

Abroad it occurs on the Norwegian coast from Bergen to Denmark, and in the Ægean in as deep as two hundred fathoms water. It is found as a fossil in the crag of England and newer Pleiocene of Sicily.

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### A. BARBATA, Linnæus.

Elongated oblong, brown ; ligamental area long and narrow.

*Arca barbata*, LINN. Syst. Nat. (not Fauna Suec.) ed. 12, p. 1140. — BROWN, Mem. Werner. Soc. vol. ii. pt. 2, p. 512. — FLEMING, Brit. Anim. p. 398. — Brit. Marine Conch. p. 102. — BROWN, Ill. Conch. G. B. p. 86, pl. 33, f. 7. — BORN, Mus. Cæs. Vind. p. 88. — CHEMN. Conch. Cab. vol. vii. p. 187, pl. 54, f. 535. — POLI, Test. Siciliæ, vol. ii. p. 135, pl. 25, f. 6, 7. — DILLW. Recent Shells, vol. i. p. 229.—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 465. — BLAINVILLE, Manuel Malacol. pl. 65, f. 1.— PHILIPPI, Moll. Sicil. vol. i. p, 57, and vol. ii. p. 42. — HANL. Recent Shells, vol. i. p. 193, pl. 9, Arca, f. 3.—REEVE, Conch. Icon. Arca, pl. 13, f. 83. — DESHAYES, Exp. Scient. d'Algérie, Moll. pl. 119 (anatomy).

„ *reticulata*, TURTON, Conch. Diction. p. 7; Dithyra Brit. p. 168, 259.

Elongated oblong, compressed cylindraceous, moderately solid, opaque, equivalve, very inequilateral, surface not shining, superficially brownish red, beneath which the texture is white, reticulately scabrous (like a file), owing to the intersection of most closely disposed nearly equidistant depressed radiating costellæ, and crowded but rather obscure concentric sulci. Coarse and somewhat flattened bristles of a dark umber-brown more or less profusely clothe the two extremities, and are arranged (the larger or principal ones) upon the middle portion of the shell in rather distant radiating series. Ventral margin straightish, or but little convex, subparallel to the dorsal edge, which is straight or slightly subincurved, and horizontal, or barely rising; anterior side (in this example) more than twice the length of the other; its extremity a little narrowed, well rounded below, obscurely angulated above. Hinder termination chiefly projecting below the middle; the oblique convex posterior edge forming an obscure obtuse angle with the dorsal margin; the lower corner somewhat rounded off. Umbones but little prominent and not far apart. Ligamental area long and narrow. Inside white; margin indented a little by the external costellæ: hinge-margin rather narrow, teeth numerous (about thirty-two).

The animal is of a pale yellow colour.

A single small specimen of this common Mediterranean shell, which measured fourteen lines in length, and not quite seven in breadth, is said to have been found alive, attached to an oyster at Killinchy in Lough Strangford, County of Down, Ireland, by Dr. Macgee, of Belfast. From this example (still preserved in the cabinet of Mr. Jeffreys), which is precisely identical with those of the Adriatic and Mediterranean, we have drawn up the above description. We have not ventured at present to include this shell positively among our indigenous productions, as no second example of a species usually abundant when present at all, has confirmed by its discovery the indigenousness of the recorded one; nor can we help surmising that there must have been some mistake made about it, for neither the habitat nor locality agree with the ordinary position and range of the species.

## PECTUNCULUS. Lamarck.

Shell equivalve, equilateral or nearly so, orbicular, closed, smooth or striated or with radiating furrows, invested with a fimbriated epidermis; margins plain or crenate; beaks separated by a grooved lanceolate ligamental area; ligament external; hinge semicircular, teeth oblique, small, interlocking. Pallial impression entire, muscular scars very strongly marked.

Animal orbicular, its mantle freely open with simple margins which are somewhat enlarged in the branchial and anal regions; foot large, semilunar, deeply grooved so as to form a disk with undulated edges; no byssus; lips formed of a linear prolongation of the branchial laminæ.

### P. glycimeris, Linnæus.

Plate XLVI. fig. 4, 5, 6, 7, and (Animal) plate P. f. 6.

Lister, Hist. Conch. pl. 247, f. 82.—Knorr, Délices des Yeux, pt. 6, pl. 14, f. 4.

*Arca glycimeris*, Linn. Syst. Nat, ed. 12, p. 1143; Mus. Ulric. p. 521.—Pennant, Brit. Zool. ed. 4, vol. iv. p. 98, pl. 58, f. 58.—Donov. Brit. Shells, vol. ii. pl. 37, f. 2.—Maton and Rack. Linn. Trans. vol. viii. p. 93, pl. 3, f. 3.—Turt. Conch. Diction. p. 7.—Dillw. Recent Shells, vol. i. p. 241.—Index Testaceolog. pl. 10, Arca, f. 36.—Mawe, Conchology, pl. 13, f. 7.

*Arca pilosa*, Linn. Syst. Nat. ed. 12, p. 1143.—Pulteney, Hutchins' Hist. Dorset. p. 35.—Mont. Test. Brit. p. 137, and Suppl. p. 53.—Maton and Rack. Linn. Trans. vol. viii. p. 93, pl. 3, f. 4.—Dorset Catalog. p. 36, pl. 11, f. 2.—Turt. Conch. Diction. p. 6.—Dillw. Recent Shells, vol. i. p. 242.—Index Testaceolog. pl. 10, Arca, f. 37.

*Glycimeris orbicularis*, Da Costa, Brit. Conch. p. 168, pl. 11, f. 2.

*Arca undata*, Chemn. (not Linn.) Conch. Cab. vol. vii. p. 224, pl. 57, f. 560.

,, *marmorata*, Chemn. Conch. Cab. vol. vii. p. 228, pl. 57, f. 563 (probably).

*Pectunculus glycimeris*, Turton (not Lamarck nor Philippi), Dithyra Brit. p. 171, pl. 12, f. 1.—Macgilliv. Moll. Aberd. p. 238.—Brit. Marine Conch. p. 103.—Brown, Illust. Conch. G. B. p. 85, pl. 33, f. 8, 9.—Burrows, Elements of Conch. pl. 8, f. 7.—Crouch, Introd. Conch. pl. 8, f. 11.—Reeve, Conch. Iconica, Pectunc. pl. 3, f. 12.

,, *pilosus*, Lamarck, Anim. s. Vert. (ed. Desh.) vol. vi. p. 448.—Turt. Dithyra Brit. p. 172, pl. 12, f. 2.—Flem. Encycl. Edin. vol. vii. p. 97, pl. 203, f. 18; Brit. Anim. p. 400.—Forbes, Malacol. Monensis, p. 42.—Brown, Ill. Conch. G. B. p. 85, pl. 33, f. 10, 11.—Blainv. Manuel Malacolog. pl. 65 bis, f. 3.—Philippi, Moll. Sicil. vol. i. p. 61,

and vol. ii. p. 44.—SOWERBY, Concholog. Manual, f. 134. — HANL. Recent Shells, vol. i. p. 162, pl. 10, Arca, f. 36, 37.
*Arca minima*, TURT. Conch. Diction. p. 8.
*Pectunculus undatus*, TURT. Dithyra Brit. p. 173, pl. 12, f. 3, 4.
„ *decussatus*, TURT. Dithyra Brit. p. 173, pl. 12, f. 5. — FLEMING, Brit. Anim. p. 400.—Brit. Marine Conch. p. 104.
„ *nummarius*, TURT. Dithyra Brit. p. 174, pl. 12, f. 6. — FLEMING, Brit. Anim. p. 400.—Brit. Marine Conch. p. 104.
„ *variabilis* (fossil), SOWERBY, Min. Conch. t. 471, f. 1.
Encyclopédie Méthodique, Vers, pl. 310, f. 3.

Retaining in preference the name *glycimeris*, an epithet bestowed upon this shell even prior to the days of Linnæus, in whose "Systema" it appeared in the tenth edition, *pilosus* being first annexed in the twelfth, we have regarded the two shells as forming but one species, inasmuch as those features upon whose existence their separation has been based, to wit, the obliquity of contour and greater inequality of the sides in the former, its angularity on the more produced side, and the radiating instead of concentric style of painting, are not constantly and collectively united in each individual, but so commingled in different examples that the exact line of demarcation cannot possibly be determined. Nevertheless, a sufficient preponderance of the differential characters is usually present in each shell, to enable us to divide the species into two well-marked and easily distinguishable varieties.

Both these have the ordinary orbicular form of the *Pectunculi*, the breadth of the valves being more frequently (not invariably) superior in the former variety, their length in the latter. In convexity both vary from scarcely ventricose to actually tumid, the profundity being chiefly umbonal, and rather rapidly diminishing at the sides and base. The structure is solid, opaque, and often ponderous; the exterior is never lustrous, but either dull or but slightly glossy. In the variety *pilosus* the sides are generally equal, and the outline only exceptionally oblique: in the more ancient form, the opposite conditions more frequently prevail. In both the ground-colour is whitish or pale red, (in the fry the entire surface, except the colourless beaks and a few small scattered splotches of white, is occasionally rufous,) adorned with more or less broad zigzag markings of dirty red, arranged in the more typical specimens of *glycimeris* in a large and somewhat radiating pattern, but having a greater tendency in *pilosus* to cluster together in numerous concentric fillets. The diversity of painting in the younger shells is infinite; one of the most beautiful of these is the *nummarius* of Turton (not of Linnæus, whose type was a young *violascens*) which is exquisitely studded all over with minute red dots. Another pretty variation of colouring is where the ground is mottled with white and flesh-colour, and sprinkled with unconnected angular red markings upon the more sparingly distributed patches of the former hue. A white variety has been found at the Arran Isles on the Irish coast by Mr. Barlee. A decussation of most delicate radiating and concentric striulæ pervades the exterior, the concentric being the more manifest where the length of the shell exceeds the breadth, the radiating where it is inferior to it. This sculpture is far more prominent in the younger individuals (*P. decussatus* of Turton), and becomes comparatively obscure in some of the more aged ones; in addition there may be seen in certain examples of the variety *pilosus* a faint appearance (as in *Siculus*) of obsolete ribs, as though costæ had once existed, and been abraded to the level of the general surface.

The ventral edge is arcuated, and rises nearly equally on both sides, although much more rectilinearly so on that one to which the beaks incline. The extremity of this, although nearly equally broad with the other, is more or less subangulated at, or a little above, the middle; the opposite end is broadly rounded, the declination, however, not vying with the basal ascent. The projecting umbones (which are occasionally oblique) are central, or nearly so; the ligamental area is moderately long, and rather narrow. The interior is either white or brownish chocolate colour; if the former, then, for the most part, with more or less extensive stains of the darker hue upon the subangulated side; if the latter, with the muscular impression upon the rounded side almost always free from colouring matter. The former painting prevails chiefly in *glycimeris*, where the central portion of the hinge-margin is narrow; the latter in *pilosus*, where that part is generally dilated at the expense of the ligament.

The number of teeth is very variable, extending at fewest from six to twelve on each side; as a general rule they are least numerous in those shells with a white interior, and are always more plentiful on the subangulated side. A kind of velvety epidermis, of a yellowish-brown colour, varying much as to closeness or looseness of texture, clothes, for the most part, the exterior of the valves in the vicinity of the margin.

Two inches may be regarded as the full diameter of the ordinary run of British examples; occasionally shells are taken of half an inch more in measurement, but the mass of individuals are ordinarily half an inch less than what we have stated. Our native specimens of the variety *pilosus* are inferior to the other in size; exotic ones, on the contrary, surpass it in that particular.

The animal is shaped like the shell; its mantle is freely open, except in the region of the hinge; the margins are plain, of a yellowish grey colour, thickly dotted with minute dark purple specks, but plain yellowish internally. Mr. Clark has observed that at "the posterior side for half its length at the very verge of the mantle, are about twenty five most minute equidistant black points, besides two short brown transverse bars." The margins of the mantle are produced into slightly expanded lips in the branchial and anal regions, and then tinged internally with purple, but they do not form siphons; though we have seen them assume the appearance of sessile orifices, owing to the habit the animal has of approximating their edges. "Under and between the termination of the posterior ends of the branchiæ is a very short cylindrical anal process, with a minute round reflexed margin" (Clark). The foot varies in colour from pure white to orange yellow; it is semilunar in shape, thick and deeply grooved; the margins of the groove are furbelowed; the posterior extremity of the foot is often dotted with purplish brown. The branchiæ vary in colour from white to brownish yellow; their filaments are free; each leaflet of each pair is equal, and of a suboval form. "From their anterior termination a pair of light brown, long linear palps, smooth on both sides, originate and pursue their course around the mouth and meet the fellow pair on the other side."

This fine shell is so very generally distributed around our coasts, that to enumerate localities would be superfluous. It is absent from none of the districts, though more abundant in some places than in others. It is generally gregarious, preferring a nullipore bottom in from fifteen to twenty-five fathoms, but ranging from eight to as deep as sixty fathoms. It is generally distributed through the European seas, and as a fossil occurs frequently in the mammaliferous crag and northern drift.

# AVICULACEÆ.

In this family, of which the British examples are few and rare, we have a passage from the dimyarian to the monomyarian lamellibranchiate bivalves, great groups, which though convenient sections, can scarcely be regarded as of ordinal value. *Avicula* has usually been included in the latter, *Pinna* in the former section, yet not only are their animals very similar, but also their shells; for though *Pinna* appears of a very different shape from *Avicula* when placed with its truncated extremity towards us, and its pointed beaks from us, yet that is not its natural position for comparison, since it is really an extremely oblique shell, and therefore should be placed before us in the direction of greatest dimension. The close affinity of these shells is further proved by their microscopic structure, as made known by Dr. Carpenter, who first maintained their relationship, associating in the same family the genera *Perna*, *Malleus*, *Crenatula*, *Vulsella*, *Gervillia*, and *Inoceramus*. All these genera have the exterior of the shells composed "of prismatic cellular substance, and the interior of true nacre." The size of the cells varies greatly in the different groups.

The animals of all the *Aviculaceæ* have freely open mantles, and a small foot with a powerful byssiferous gland.

## AVICULA. Lamarck.

Shell oblique, inequivalve, inequilateral, upper valve most convex, lower one notched for the passage of the byssus; surface smooth, or scaly, or radiatingly ribbed; hinge-line straight, often winged; a single cardinal tooth in each valve; ligament partially external, linear. Pallial impression entire; muscular scars two or more, one very large, the rest small.

Animal shaped like the shell, its mantle freely open, with cirrhated margins; no siphons; foot small, cylindric, furnished with a byssal groove; palps large; adductor muscles very unequal, one being greatly larger than the rest.

Although during ancient epochs sufficiently plentiful in the seas of our area, now we have but one species of this genus, and that one exceedingly rare. Its living allies are for the most part tropical, and some of them grow to a great size, and are remarkable for beauty or eccentricity of shape, or for the pearls they furnish; for *Meleagrina*, from species of which the best pearls are fished in the Indian Seas, is at best but a subgenus of *Avicula*.

### A. Tarentina, Lamarck.

Plate XLII. fig. 1, 2, 3, and (Animal) plate S. fig. 4.

*Mytilus hirundo*, Linn. Syst. Nat. ed. 12, p. 1159 (partly).—Turt. Conch. Diction. p. 109, f. 7.—Poli, Test. Sicil. vol. ii. p. 221, pl. 32, f. 17 to 21.—Dillw. Recent Shells, vol. i. p. 321 (var. G.).—Mawe, Introd. Linn. Conch. pl. 16, f. 6.—Costa, Cat. Test. Sicil. p. 59.

„ *e mari Mediterraneo*, Chemn. Conch. Cab. vol. viii. p. 142, pl. 81, f. 725.

*Avicula hirundo*, Turt. Dithyra Brit. p. 220, pl. 16, f. 3, 4.—Flem. Brit. Anim. p. 405.—Brit. Mar. Conch. p. 113.

*Avicula Tarentina*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 99.—Brit. Mar. Conch. f. 109.—DESH. Encyclopéd. Méthod. Vers. vol. ii. p. 99.—PHILIPPI, Moll. Sicil. vol. i. p. 76, and vol. ii. p. 55.—HANL. Recent Shells, vol. i. p. 262.—DESH. Exp. Scient. Algérie, Moll. pl. 129.

„ *falcata*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 98 (*fide* Desh.)

„ *aculeata*, SOWERBY, Genera Shells, Avicula (from Madeira), f. 2 (probably).—REEVE, Conch. Systemat. pl. 109, f. 2 (from last).

„ *Anglica*, BROWN, Illust. Conch. G. B. p. 74, pl. 23, f. 3.

„ *Atlantica*, BROWN, Ill. Conch. G. B. p. 74, pl. 46, f. 7 (from Turton's figure).

Encyclopédie Méthodique, Vers, pl. 177, f. 8.

It is difficult to find any object to which we may liken the shape of this graceful bivalve; some individuals, however, whose wing is peculiarly elongated, have a contour like that of a falchion. Perhaps the image of a mussel placed in an oblique position, with a small subtriangular lobe on one side of its apex and an elongated wing-shaped appendage on the other, would convey as near an ideal of its shape, as can be approached by language. The shell is thin and extremely fragile, moderately convex, and with more or less of a resinous gloss. The colour is of a pale olivaceous yellow, with more or less distinct and numerous rays or blotches of a smoky brown; sometimes there are clusters of zigzag streaks, or even long and uninterrupted rectilinear ones, but their arrangement is invariably radiating. The surface which is usually smooth upon the umbones, is elsewhere either marked with somewhat remote concentric striæ, or covered towards the margin with rather distant foliaceous subimbricated laminæ. These, in the finer examples, are closely set with appressed and somewhat spinous scales, which, however, are almost invariably abraded in the old, and not yet developed in the young, exhibiting only more or less faint indications of a foliaceous structure. The body or main portion of the shell is (in the more typical examples) very oblique and rather narrow; the ventral outline is strongly arcuated, forming one wide sweep from the end of the lobe to the most produced extremity of the body, which latter is decidedly but not immoderately, shorter than the subtriangular wing, the sinus beneath which is not particularly profound, and more frequently is inferior to, than it exceeds, a right angle, but varies much in depth and extent, according to the greater or lesser elongation of the dorsal wing. Generally speaking, a straight line drawn from the beaks to the most projecting part of the lower margin is equal or nearly so to the extreme length of the wing edge. The trigonal lobe is moderately large, and in the more convex valve as broad as it is long; the byssal passage prevents this being the case in the lesser valve. The beaks are prominent, and not usually adjacent to each other. The lobes and the area between the body and the wing are much compressed, and the dorsal or cardinal line is very long. The sides of it are extremely unequal, the upper edge of the wing being from four to six times the length of the upper edge of the lobe; the greater disproportion more usually exists in the adult. There is a single small blunt somewhat triangular tooth under the acute, very oblique but inflected beak in one valve, and two obsolete denticles in the other. The medial portion only of the interior is covered with a thin stratum of nacre, which is usually prismatic.

The largest individual we have observed measures nearly four inches in length.

The little specimen (a single valve) delineated by Turton in both his "Dictionary" and "Dithyra," can only, we imagine, be regarded as a variety of this shell, although its outline seems very different. Its body (partly, however, from the terminal edge being chipped) seems less narrow, oblique, and produced than usual; the surface is worn smooth, and the preponderance of darker markings causes it to appear rayed with yellowish white on a ground of chocolate brown.

The animal, which we have seen alive in the Mediterranean, is of a yellowish white colour. Its mantle edges are freely open; each pendant margin is fringed with a basal range of short closely-set white cirrhi and a marginal row of rather long ones, which, as well as the mantle itself, are whitish, mottled with brown. The branchiæ are white. The foot is white, short and small in proportion to the animal, and spins a strong byssus from its basal groove.

This is a very rare shell, as a British species, and has hitherto been found only towards the South. It was first taken by Miss Hutchins in Bantry Bay, and Mr. Warren has two specimens from the neighbourhood of Dublin. On the English coast it has occurred in Devon and Cornwall. It is more frequent in the Mediterranean Sea.*

## PINNA, Linnæus.

Shell very oblique, wedge-shaped, triangular, equivalve, exceedingly inequilateral, more or less thin and fragile, gaping posteriorly; surface smooth, or scaly, or obliquely furrowed; beaks terminal. Hinge straight, long, toothless; ligament linear, internal. Pallial impression entire, muscular scars very unequal.

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* Turton, in his "Conchological Dictionary of the British Islands," has introduced (p. 108) the *Avicula Morio* of Leach (Zoological Miscellany, pl. 38, f. 2), but has virtually withdrawn it by omitting the species in his subsequent quarto on British Bivalves. It is very probable that the specimen stated to have been dredged by Mr. Prideaux in Plymouth Sound was only our ordinary British species; at least nothing in the very brief description militates against the supposition.

Animal triangular, mantle freely open, no siphons; mantle-margins with cirrhated edges; mouth with foliaceous lips and short palps; anus furnished with a long lingulate valve; foot small, with a byssal groove; adductor muscles very unequal.

This genus is an ancient one; species of it presenting marked resemblance to existing forms are present in oolitic strata. The number of living species is not great, but they are widely distributed, and many of them remarkable for their size. Our native *Pinna* is the largest bivalve inhabiting the British seas. The *Pinnæ* are mostly sublittoral, but are capable of considerable ranges in depth. They live in sand and mud, their gaping extremity upwards and their beaks plunged deep in the ground. Their byssus is strong and silky, and in Sicily is sometimes made into gloves or stockings, more for curiosity than use. A little crab is often found within the shell when the true inhabitant is alive, and many fables have been narrated of their friendship.

### P. PECTINATA, Linnæus.

Plate XLIII. fig. 1, 2, and Plate LIII. fig. 8.

*Pinna pectinata*, LINN. Syst. Nat. ed. 12, p. 1160.—PULTENEY, Hutchins, Hist. Dorset, p. 39.—MONT. Test. Brit. p. 178.—MATON and RACK, Trans. Linn. Soc. p. 113.—RACKETT, Dorset Catalog. p. 41, pl. 3, f. 3.—TURT. Conch. Diction. p. 148, f. 11; Dithyra Brit. p. 223, pl. 19, f. 1.—FLEMING, Brit. Animals, p. 406. —LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 64 (partly).—DILLW. Recent Shells, vol. i. p. 325.—MAWE, Linn. Conchol. pl. 17, f. 1.—HANL. Recent Shells, vol. i. p. 253.

„ *fragilis*, PENN, Brit. Zool. ed. 4, vol. iv. p. 14, pl. 69, f. 80.—TURT. Dithyra Brit. p. 222, pl. 20, f. 2.—FLEMING, Brit. Anim. p.

406.—Brit. Marine Conch. p. 111.—BROWN, Illust. Conch. G. B. p. 75, pl. 26, f. 3.

*Pinna muricata*, DA COSTA (not of authors) British Conchol. p. 240, pl. 16, f. 3.—DONOV. Brit. Shells, vol. i. pl. 10.—CROUCH, Introd. Lam. Conch. pl. 11, f. 4.

„ *ingens*, MONT. Test. Brit. p. 180, 583, and Suppl. p. 72.—MATON and RACK, Trans. Linn. Soc. vol. viii. p. 113.—TURT. Conch. Diction. p. 148; Dithyra Brit. p. 222, pl. 20, f. 1.—FLEMING. Encyclop. Edin. vol. vii. pl. 206, f. 3; Brit. Anim. p. 406.—COUCH, Cornish Fauna, pt. 2, p. 34.—MACGILLIV. Moll. Aberd. p. 240.—Brit. Marine Conch. p. 111.—BROWN, Illust. Conch. G. B. p. 75, pl. 26, f. 1.—DILLW. Recent Shells, vol. i. p. 325. —LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 66.—Index Testaceolog. pl. 12, Pinna, f. 3.—HANL. Recent Shells, vol. i. p. 253, pl. 12, f. 3.

„ *lævis*, DONOV. Brit. Shells, vol. v. pl. 152.

„ *papyracea*, TURT. Dithyra Brit. p. 224, pl. 20, f. 3.—FLEMING, Brit., Anim. p. 407.—Brit. Marine Conch. p. 112.

„ *rotundata*, COUCH, Cornish Fauna, pt. 2, p. 36.

„ *elegans*, BROWN, Illust. Conch. G. B. p. 76, pl. 26, f. 2.

The members of this genus, which, from the usual abrasion of their spinous sculpture with advancing age, are far more characteristic in their earlier state, become occasionally so altered in outline, when old, that several species have been constituted (as in the present shell, in the *nobilis* of the Mediterranean, &c.) from the different stages of increase.

The valves, which are of a lighter or darker horn-colour, and neither rayed nor mottled with any other hue, except that near the umbones they are shaded with somewhat metallic tints of dirty green or smoky purple, are semitransparent when young, moderately ventricose, and strongly hiant at the broader extremity. About a dozen slightly elevated rounded narrow ribs emanate from the beaks and radiate posteriorwards, but often in the young, and almost invariably in the adult, become obsolete before they reach the hinder extremity. These, however, do not occupy the entire surface of the shell, since the lower or ventral portion (about a third or a fourth of the entire area) is not traversed by them. No echination is visible, for the most part, upon the more aged examples, but short upright caducous vaulted scales, of small size, and disposed at moderately distant intervals, often crown the ridges of the younger specimens; in which case there is generally a kind of obscure radiation of obsolete scales upon the portion otherwise devoid of sculpture. The concentric wrinkles of increase, although not forming (as in certain *Pinnæ*) a distinct lattice-work, are nevertheless rather prominent in the older shells, run nearly at right angles to the dorsal or hinge margin, and often give, by their convergence at the basal margin, a laminated appearance to the structure of the valves. The dorsal edge is not (as in certain allied species) incurved towards the beaks, but is nearly rectilinear in the more regularly developed individuals, with a descending inclination near the narrow end of the shell. The ventral edge, after the ordinary anterior indentation and subsequent swell, runs in young shells (that do not exceed six inches in length) almost subparallel to the upper margin and in nearly a straight line, so that (except in stunted individuals) the broad end of the valves is somewhat squared, and by no means peculiarly broad; the terminal edge is, however, convex or even arcuated. With advancing age, as the upper and lower margins diverge farther from each other, the general contour becomes more broadly triangular, the dorsal edge slopes a little downward at its termination, the ventral margin becomes more produced in proportion (in the young it is inferior in length to the opposite edge), and the terminal or posterior outline usually assumes a more rounded or arcuated appearance. The interior either partakes of the external colouring, or is dark and subnacreous.

This species, as Montagu observes, is not uncommonly twelve inches long, and seven inches broad at the gaping end. Individuals, indeed, of still larger dimensions are obtained near Torquay, in S. Devon (S. H.). Montagu discovered a bed of these shells on a gravelly bottom covered with mud and long seaweeds at Salcomb bay, in the same county, which was only occasionally accessible when the tide receded beyond its usual limits. The valves stood upright with the broader end about an inch above the surface, and the lower end fixed so firmly to the soil by a very large strong byssus two or three inches in length, composed of numerous fine silky fibres of a dark purplish brown, as to demand the exercise of considerable force for their removal. "Some of these shells have been taken annually for many years, the animal having been accounted very good food; but they require at least five or six hours stewing to render them eatable; if this is properly attended to, they are nearly as good as *Scallops*, but never so tender" (Mont.). Weymouth and Dorset coast (S. H.). Off Eddystone Lighthouse (Montagu); Milford Haven (Lyons); Hebrides (Montagu); Zetlands in deep water (E. F.). Off Cape Clear in sixty fathoms dead (M'Andrew). Rare on the west coast, except towards the south, where all the varieties have been observed; coasts of Londonderry, Antrim, and Down; in fifty fathoms off Island Magee on the Antrim coast (W. Thompson); Cove of Cork (Humphreys, Ball). It occurs on the other European coasts.*

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* "This species," observes Couch, in his Fauna of Cornwall, "is found in the greatest abundance at the distance of from three to six leagues south of the Deadman Point, where they stud the bottom in multitudes, with only two or three inches of the pointed end inserted into the soil. It is common for the line or hook to become entangled among these shells, and powerful effort is required to drag them from their attachment, which is only effected by breaking the byssus, or

### SPURIOUS.

## P. CARNEA, Gmelin.

KNORR, Délices des Yeux et de l'Esprit, pt. 2, pl. 23, f. 1.
*Pinna haud ignobilis*, CHEMN. Conch. Cab. vol. viii. p. 212, pl. 87, f. 769.
„ *saccata*, SCHRÖTER (not Linn. nor authors), Einleit. Conch. vol. iii. pl. 9, f. 17.
„ *carnea*, GMELIN, Syst. Nat. p. 3365.—DILLW. Recent Shells, vol. i. p. 326 (chiefly). — Index Testaceolog. pl. 12, Pinna, f. 6.—HANLEY, Recent Shells, vol. i. p. 252, pl. 12, Pin. f. 6.
„ *muricata*, PULTENEY (not author's), Hutchins, Hist. Dorset, App. p. 39.—MONT. Test. Brit. p. 183, pl. 5, f. 3.—Dorset Catalog. p. 41.—TURT. Conch. Dict. p. 149 ; Dithyra Brit. p. 224.—FLEMING, Brit. Anim. p. 406.
„ *flabellum*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 61 (in part).

*A West Indian shell, introduced by Pulteney as found on the Dorset coast, but repudiated as British by most subsequent writers. The original specimen, which is so worn as to be almost entirely destitute of scales, is much less obliquely rounded at the wider end than that represented by Montagu, and exhibits six or seven rather broad longitudinal costæ. The* P. muricata *of the Linnean Transactions (vol. viii. p.* 113) *is different, being copied verbatim from the "Museum Ulricæ."*

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tearing away the ground to which it is attached. In the latter case, a rich harvest of shells is often afforded, but the pointed end of the *Pinna* is usually broken off by the violence. It is perhaps owing to the different degree in solidity of the ground, that the shells living in the deeper water are so much less buried than those of which Montagu speaks, and one of the consequences may be a greater degree of motion in the shell. Montagu observes that the exposed end cannot be closed by art, but the animal is capable of effecting it, and observation has taught me, that this is its method of obtaining food. In its ordinary position this opening is about two inches wide, exposing the contained animal which occupies but a small portion of the cavity, and seems to offer itself as a prey to the first creature that may choose to devour it. Some fish is thus tempted to enter, but the first touch within is a signal for its destruction. The shell closes not only at the side but top, the latter action being effected by the separation of the pointed ends, and the captive is either crushed to death, or soon perishes, from confinement."

## Perna alata, Gmelin.

Knorr, Délices des Yeux, pt. vi. pl. 21, f. 1.
*Ala corvi pendula*, Chemn. Conch. Cab. vol. vii. p. 253, pl. 59, f. 581.
*Ostrea alata*, Gmelin, Syst. Nat, p. 3339.—Dillw. Recent Shells, vol. i. p. 283.
„ *perna*, Wood, Index Testaceolog. pl. 11, f. 78.
*Perna obliqua*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 75.—Hanl. Recent Shells, vol. i. p. 258.
„ *ephippium*, Sowerby (not Lam.) Genera Shells, Perna, f. 2.—Reeve, Conch. System. pl. 106, f. 2.
*Crenatula Travisii*, Turt. Mag. Nat. vol. vii. p. 350, f. 47.—Brown, Illust. Conch. G. B. p. 75, pl. 23, f. 20.

*A West Indian shell; introduced by Turton as found at Scarborough. The type, which exactly resembles the figure of the young shell attached to the adult* Perna, *in the Genera of Shells by Mr. Sowerby, was taken from the bottom of a foreign vessel.*

# OSTREADÆ.

This large and important family includes shells of very various outline and sculpture constructed by animals presenting considerable variations in the features of their foot and mantle, but nevertheless having so many important characters in common that we do not think it advisable to subdivide the group. For though the foot in *Ostrea* is obsolete the other characters of the animal of that genus are such that we cannot place it in a distinct group from *Anomia* on the one hand, or *Placuna* on the other, through both which genera we have a very natural transition into *Pecten*. The long fringes of the mantle in *Lima* might seem to indicate a different family, but in *Lima spinosa* we find them very short and associated with ocelli as in *Pecten*, and in *Limea* * the mantle has no tentacles. All the tribe have the mantle freely open, no tubes, a small or obsolete foot probably capable in some stage of the animal's existence of spinning a byssus, and constantly doing so in some species, united adductor mussels, leaving a single impression in the shells, and a ligament wholly, or partly interior, lodged in a cardinal groove, and sometimes accompanied with teeth.

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* Among the future additions to the British Fauna will probably turn up *Limea Sarsii* of Löven, a shell which seems to be identical with the *Lima crassa* of the Ægean.

### LIMA, Brugière.

Shell more or less obliquely oblong, equivalve, usually inequilateral, closed in front, more or less gaping at the sides, eared on each side of the hinge. Surface smooth, or striated and grooved in a radiating fashion, the ribs often scaly. Beaks separated by a rhomboidal area. Ligament occupying the expansion of the hinge-line on each side of a strong cartilage, set in a triangular pit under the beak of each valve. Pallial impression entire, muscular scar eccentric.

Animal oval, mantle freely open, its margins pendant and fringed with long tentacular filaments. Ocelli absent or inconspicuous. No siphons. Body produced, in part linguiform. Foot small, ligulate, furnished with a byssal groove. Labial palps subtriangular, small, pectinated; mouth surrounded by tentacular filaments; anal tube cylindric, externally visible. Branchial leaflets equal on each side.

The species of this genus bear a close affinity to *Pecten*, yet constitute a very natural group of themselves. The *Limæ* appeared in very ancient epochs, and during the oolitic period, species were comparatively abundant and attained great dimensions. The fossil genus *Plagiostoma* is synonymous with *Lima*. Some twenty well marked forms inhabit existing seas, living in various depths of water, either free or moored by a byssus or enveloped in nests formed of byssal filaments.

The animals are very beautiful and curious, and often much larger than their shells, which in the greater number of species, though remarkable for elegance of outline and sculpture, rarely present any other colour than a milky white. The majority of known living species come from the South Seas and Indian Ocean.

A sub-genus *Limatula* has been proposed by Mr. Searles Wood for those species which are nearly equilateral. Neither their shells nor animals materially differ from their more oblique congeners.

### L. SUBAURICULATA, Montagu.

Valves much swollen, nearly equilateral; neither oblique nor gaping.

Plate LIII. fig. 4, 5.

*Pecten subauriculatus*, MONT. Test. Brit. Suppl. p. 63, pl. 29, f. 2.—FLEMING, Encyclop. Edin. pl. 205, f. 12.

*Ostrea subauriculata*, TURT. Conch. Diction. p. 131.—Index Testaceolog. Suppl. pl. 2, Ostrea, f. 5.

*Lima subauriculata*, TURT. Dithyra Brit. p. 218.—FLEMING, Brit. Animals, p. 388.—Brit. Marine Conch. p. 114.—SOWERBY, Thesaur. Conch. vol. i. p. 84, pl. 22, f. 23.—PHILIPPI, Moll. Sicil. vol. ii. p. 56.—HANLEY, Recent Shells, vol. i. p. 266, suppl. pl. 2, Ostrea, f. 5.—LOVÈN, Index Moll. Skandinav. p. 32.

„ *nivea*, PHILIPPI, Moll. Sicil. vol. i. p. 78.

„ *sulcata*, BROWN, Illust. Conch. G. B. p. 74, pl. 23, f. 4, 5.—MÖLLER, Moll. Groenlandiæ, p. 16.

„ *sulculus*, LOVÈN, Index Moll. Skandinav. p. 32?

*Limatula subauriculata*, S. V. WOOD, Mag. Nat. Hist. new series (Charlesworth's), vol. iii. p. 236, pl. 3, f. 6 (fossil).

At present this species, which bears a remarkable likeness to the *bullata* of Born, but differs as well by its size, as by the much greater tenuity and number of its costellæ, which even in the earlier stages in that exotic shell are manifestly coarse, and comparatively few, is by far the rarest of our *Limæ*, and, indeed, is one of our scarcest bivalves. It is extremely tumid, almost equilateral, and scarcely at all oblique, excessively fragile and subdiaphanous, white in the young, but rather stronger and more opaque in the larger single valves which are occasionally discovered. When viewed sideways, its united valves appear distinctly heart-shaped; the swell is chiefly manifest upon the middle portion of the shell below the umbones, and diminishes rapidly and nearly equally on either side of them. The valves which are closed on both sides, are divided in the middle by a concave radiating groove, on either side of which the surface is set with very fine and closely crenulated radiating costellæ, which do not extend to the extremities of the shell, but for the most part occupy only the middle portion of it. The interstices, which are larger than the costellæ, are not squarely cut out, but slightly shelving, which causes the latter to become more or less acute at their upper edges. The shape of the shell is nearly elliptical, and its sides are of nearly similar curvature, both arching almost uninterruptedly to the attenuated and well-rounded ventral margin; the greatest length of the valves is scarcely above the middle. The hinge-margin is nearly equal to one-third of the breadth, and scarcely declines in the least on either side of the prominent umbones, whose apices (the beaks) are rather distant, and directly inflected, not leaning to either side. The ligamental area is moderately wide, its central oval (in fresh specimens) is orange-yellow, the remaining portion is light green. The auricles are of equal size, and distinctly angulated, the angles being rather more than rectangles.

The largest single valve in our cabinet measures slightly beyond seven lines in width, and rather exceeds one-third of an inch in length; although occasionally still larger valves are met with, the average of living examples can scarcely be computed at more than five lines in breadth, and three in length.

The animal closely resembles that of *Lima bullata*. The tentacula are of a pale pink colour, and the foot and body are of a pale orange hue. We have never observed it to make a nest. It lives for the most part on very muddy ground.

This is a rare shell and very seldom taken alive. A single valve at Herm (S. H.). Pollkerar Cove (Miss Lavers). Whitesand Bay (Jeffreys). Off Plymouth in twenty-five fathoms, and Penzance in twenty fathoms (M'Andrew and E. F.). Off Laxey, Isle of Man, in fifteen fathoms (E. F.). At Oban in fifteen fathoms, mud; off Cape Wrath in fifty fathoms, and at the same depth in the Minch, and between Fair Island and the Zetlands (M'Andrew and E. F.). Lochs Alsh and Carron (Jeffreys). Eda Sound, Orkney, among coral and broken shells (Thomas). Loughs of Strangford and Belfast extremely rare (W. Thompson). It ranges along all the coasts of Europe.

### L. Loscombii, Sowerby.

Valves swollen, inequilateral, oblique, closed on one side, gaping slightly at the other.

Plate LIII. fig. 1, 2, 3.

*Pecten fragilis*, Mont. (not Chemnitz) Test. Brit. Suppl. p. 62.
*Ostrea fragilis*, Turt. Conch. Diction. p. 131.
*Lima bullata*, Turt. (not *Ostrea bullata*, Born) Dithyra Brit. p. 218, pl. 17, f. 4, 5.—Brit. Marine Conch. p. 114.
„ *Loscombii*, Sowerby, Genera Shells, Lima, f. 4.— Macgilliv. Moll. Aberd. p. 228.—Reeve, Conch. Systemat. pl. 112, f. 4.—Sowerby, Thesaur. Conch. vol. i. p. 86, pl. 22, f. 20, 21, 22.—Hanl. Recent Shells, vol. i. p. 267.
„ *fragilis*, Forbes, Magaz. Nat. Hist. vol. viii. p. 594, f. 65; Malac. Monens. p. 40.—Brown, Ill. Conch. G. B. p. 74, pl. 23, f. 6, 7, 7*. — S. V. Wood, in Mag. Nat. Hist. new series (Charlesworth's), vol. iii. p. 235, pl. 3, f. 3.

This very delicate and fragile *Lima* is of an uniform pure and somewhat transparent white. Its valves, which are alike both in size and profundity, are obliquely subovate, and more or less swollen. The convexity, which is chiefly manifest upon the umbonal region, diminishes thence with tolerable evenness on either side; but from the posterior lateral compression, the shell appears rather deeper at that extremity. The united valves when examined sideways appear heart-shaped, owing to the distinct but gradually diminishing ventricoseness of the valves towards the base of the shell.

The sculpture merely consists of fine radiating elevated striæ (with, for the most part, still finer intervening ones), which are simple (not distinctly granular or squamiferous), very numerous, chiefly perceptible and farthest apart near the centre, more crowded and gradually disappearing in front, and rather more abruptly obsolete posteriorly. The posterior margin runs in a nearly straight and almost uninterrupted line; the anterior edge first inclines forward in an arcuated line, then suddenly bending back, runs in a convex line to the somewhat attenuated and well rounded ventral margin, so as to be subparallel (although rather more oblique) to the opposite edge. The chief anterior swell is decidedly above the middle, and most frequently, in the full-grown shell, at about two-fifths the distance from the hinge-margin. There is no posterior gape, and only a very slight linear hiation at the front dorsal region. The hinge-margin is very short, not much more than a quarter of the width of the shell, and declines with tolerable evenness on either side. The auricles are tolerably distinct and well defined; both form obtuse angles, but the lateral outline of the hinder is more concave than that of the other. The ligamental area is of moderate breadth, and the beaks prominent and rather broad.

Three-quarters of an inch in breadth, and half an inch in length, are the dimensions of rather large examples.

Animal shaped like the shell; it is of a colour varying from pale orange to pale crimson, the mantle margins being reddish white; they are quite open all round in front and at the sides, plain at their free edges and fringed with three rows of long tentacular filaments at their junction with the shell: the innermost series of these is longest. The body is white; the foot small, cylindrical, and furnished with a conspicuous byssal groove.

The habits of this species have been observed by Mr. Clark, who has seen it "repeatedly fix itself by fine byssal filaments, then detach itself and move with the greatest rapidity, crossing a dish of six inches' diameter whilst *one* could be counted. The rounded extremity is that which is in front and the beaks behind, when the animal moves: this operation is performed by placing itself on the whole length of the straighter or ventral range, having the dorsal or rounded side uppermost; then opening its valves wide, it suddenly flaps them together, and so on, and thus moves with extraordinary celerity; not using the foot, which appears to this animal to serve rather for fixing itself than for motion."

This is the most generally distributed of our British *Limas*, though from the delicacy of its shell, it is difficult to obtain perfect specimens. Herm at low water (S. H.); Portland Island in fifteen fathoms, Penzance in twenty fathoms, Anglesey in ten to twenty-five fathoms, gravel (M'Andrew and E. F.). Exmouth (Clark); Isle of Man in twelve to twenty-five fathoms, on Nullipore ground and Scallop banks (E. F.); rare at Scarborough (Bean); and on the Northumbrian coast (Alder). Oban, Loch Carron, Ullapool, and Lerwick (Jeffreys). Off Cape Wrath in fifty fathoms, the Zetlands in fifteen and fifty fathoms, Moray Firth in thirty-four fathoms (M'Andrew); Eda Sound, Orkney, and off Aberdeen (Thomas). "Each side of the Irish coasts; dredged sparingly in the deeper parts of the Loughs of Strangford and Belfast (Thompson)." It ranges throughout the European seas.

### L. HIANS, Gmelin.

Valves shallow, gaping at both sides.

Plate LII. fig. 3, 4, 5, and (Animal) plate R. (under the name of *L. tenera*).

*Die klaffende Kammuschel*, (*The gaping Pecten*) SCHRÖTER, Einleit. Conch. vol. iii. p. 332, pl. 9, f. 4.

*Ostrea hians*, GMELIN (from Schröter), Syst. Nat. p. 3332.—DILLW. Recent Shells, vol. i. p. 270.—Index Testaceol. pl. 11, f. 53.

*Lima tenera*, TURT. (not *Ostrea tenera* of Chemn.) Zoolog. Journ. vol. ii. p. 362, pl. 13, f. 2.—FORBES, Malac. Monens. p. 41.—BROWN, Illust. Conch. G. B. p. 74, pl. 23, f. 8, 9.—PHILIPPI, Moll. Sicil. vol. i. p. 77, and vol. ii. p. 57, pl. 16, f. 3.

„ *bullata*, PAYRAUDEAU, Moll. Corse, p. 70.—D'ORBIGNY, Moll. Canar. p. 101.

„ *vitrina*, BROWN, Conchol. Text-Book (1833), p. 113, pl. 15, f. 7; Illust. Conch. G. B. p. 74, pl. 23, f. 10, 10*, 11, 11*.

„ *fragilis*, FLEMING, Brit. Animals, p. 388 (in part).—COUCH, Cornish Fauna, pt. 2, p. 37.

*Limæ*, FORBES, Mag. Nat. Hist. vol. viii. p. 593, 594, fig. 63, 64.

„ *inflata*, FORBES, Malacolog. Monensis, p. 41.—BROWN, Ill. Conch. G. B. p. 74.

„ *aperta*, SOWERBY, Thesaur. Conch. vol. i. p. 87, pl. 22, f. 26, 27, 28, 29. —Brit. Marine Conch. p. 249.—HANLEY, Recent Shells, vol. i. p. 268.

„ *Sarsii*, KRÖYER (*fide* LOVÈN).

„ *hians*, LOVÈN, Index Moll. Skandinaviæ, p. 32.

„ *exilis*, S. V. WOOD, Mag. Nat. Hist. new series, vol. iii. (Charlesworth's) p. 234, pl. 3, f. 1 ? (fossil).

„ *oblonga*, S. V. WOOD, Mag. Nat. Hist. new series, vol. iii. p. 234, pl. 3, f. 2 (fossil).

The peculiar hiation of this widely-diffused species, which although the last described of our British *Limæ*, was known to the student of general Conchology, long before the days of Montagu (who first introduced a member of this genus into the Fauna of Great Britain), readily enables us to discriminate specimens, however aberrant, from the two other species which inhabit our islands. The form is obliquely and unsymmetrically suboval, and more produced than in most species of its genus. It is much and rather suddenly attenuated above, narrowed and moderately arcuated below, and decidedly gaping at both extremities. The front hiation is extremely large, forms a narrow oval cavity as far as the bend of the anterior side, and then rather abruptly contracting, extends with very gradual diminution even to the ventral margin. The hinder gape is much narrower, and in the young shell, where it is almost linear, is only manifested on the lower portion of the valves, but in the adult (where the valves only touch at the hinge-margin and its opposite edge) is continued upward, attenuating as it proceeds, even to the auricles. At this stage, then, the hiation is conversely dilated on the two sides. The snow-white valves, which are very inequilateral, are apt to become stained with brown in the larger individuals; they are, when adult, less translucent than in *Loscombii*, and although thin and fragile, yet comparatively firm in texture. They are chiefly ventricose, if at all so, at the umbonal region, but when separated are decidedly shallow. The exterior is almost entirely covered with very numerous close-set costellar striæ, which are more or less roughened, and somewhat squamosely so, by concentric lines of increase; occasionally a raised interstitial stria likewise presents itself between each of the larger ones. The anterior side of the shell at first slopes forward, and generally with but little convexity; after proceeding about two-fifths of its course, it rather abruptly changes its direction, and runs subparallel to, but rather more obliquely than, the straightish edge of the posterior side. The front margin, as far as the curvature, is margined internally by a thickening of the substance of the shell. The hinge-margin is extremely short, frequently indeed, not more than equalling a fifth of the breadth of the valves ; the edge declines on both sides, and occasionally slopes, in the adult, so remarkably behind, as to render the posterior auricle obscure, especially when contrasted with the well-defined and very acutely-tipped anterior one. The ligamental area is large, and, in the full-grown examples, profound ; the beaks are very acute and inclined.

This shell attains to far larger dimensions than either of our other species of *Lima*, individuals that measure an inch and three-quarters in breadth, and about one-third less in length, being by no means of uncommon occurrence in North Britain. The southern examples are far smaller ; those which we have taken in Guernsey, as well as those from which Turton (the first to introduce the species as a native of our coast) derived his description, being scarcely more than half that size. We doubt, however, if these were adult, as they agree in hiation, etc. with the younger individuals of the northern ocean. The want of intermediate specimens, and the very great rarity of those from the south preventing a comparison, have caused the larger northern shell to be esteemed a different species.

The colour of the animal is often very beautiful, varying from pale crimson to intense vermilion ; the mantle lobes are often tinted with orange. The tentacula are ranged in three distinct series, all towards the inner or attached edges of the mantle lobes : the innermost row (that nearest the shell) is much the shortest, the outermost longest, and all are capable of considerable extension, when the cirrhi appear as if annulated: the largest cirrhi are those above and around the anal region. The branchiæ are deep crimson and large. The belly is carinated, and as well as the channeled cylindrical foot, of the same brilliant hue. This species can spin for itself a compact nest of byssal threads entangling small stones, shells and fragments of nullipore; in the midst of it lies the *Lima*, resting on a smooth inner coating of fibres. As this animal is much more frequently taken free than found thus imbedded, and as it is a very active creature, swimming through the water with great rapidity, it is most likely that this nest-making habit is connected with some peculiarity in its economy at some particular period of its existence. We have never seen any but full-grown specimens contained in these curious nests.

This pretty shell is one of the scarcer inhabitants of the British coasts; it occurs in various depths of water. Specimens from different localities are often easily distinguishable. Herm, in pools at low-water, alive but scarce (S. H.); Penzance, in twenty fathoms, and Anglesey, in twelve fathoms (M'Andrew and E. F.); on the north coast of the Isle of Man, in twelve to twenty-five fathoms, on scallop banks, frequent, and attaining considerable dimensions (E. F.). Not uncommon among nullipores in Rothesay and Kames Bays, Isle of Bute, Lamlash Bay, Isle of Arran, and Oban, where it is large (Alder); Oban, —the inflated variety,—alive in fifteen fathoms (M'Andrew and E. F.); off Sana Island, in forty fathoms (Hyndman). Loch Carron (Jeffreys). Eda Sound, Orkney, in fifteen fathoms (Thomas); Belfast Bay, in seven fathoms (Portlock). "Valves have been found in a recent deposit of mud in Belfast Bay, close to the town" (W.

Thompson). It is found on the coast of the Continent, from Norway to the Mediterranean. It is found fossil in the Crag.

### PECTEN. Brugière.

Shell oblong or suborbicular, regular, inequivalve, subequilateral, closed, eared at each side of the hinge ; surface smooth or sulcated with radiating, often scaly, ribs, or minutely striated and granulated in various directions. Beaks approximated. Hinge line straight, with a marginal linear ligament, and a central cartilage lodged in a triangular pit under the beak of each valve ; one valve with a byssal sinus. Interior with an entire pallial impression, and a single large subcentral muscular scar.

Animal shaped as the shell, mantle freely open, with pendant margins bearing (usually two) fringes of tentacular filaments, the one series at their fixed, the other at their free border. Among the former are ranged globular shining ocelli. No siphonal tubes. Body large, apiculated. Sexes united.* Foot small, cylindrical, with a byssal groove, from whence a weak byssus is spun, mostly when the animal is young. Mouth surrounded by foliaceous leaflets and two pair of labial tentacles which are smooth externally, pectinated internally. Branchial leaflets equal, each pair partially doubled on itself.

This beautiful genus, which includes more than one hundred existing species and a very great number of fossils, has several very elegant and useful representatives in the British seas. The majority of *Pectens* are tropical, and among them we find the most brilliantly painted of bivalves. They live either solitary or in great assemblages, at various depths of water, resting in a horizontal position, with the less convex and most brilliantly coloured valves usually upwards. They are active animals, capable of making their way through the water, by flapping their valves together, with great rapidity. Those which have the upper valve quite flat or concave, have been distinguished generically by the name of *Janira*, but the transitions of form in the genus and the characters of the animal, forbid such artificial distinction.

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* See Milne Edwards in Ann. des Sc. Nat. xviii. p. 321.

### P. VARIUS, Linnæus.

Echinated, very rarely pure white; about 28 much-elevated ribs; ears very unequal.

Plate L. fig. 1.

LISTER, Anim. Angl. pl. 4, f. 30.—KNORR, Délices des Yeux, pt. 5, pl. 13, f. 2, and pt. 6, pl. 9, f. 4.

*Ostrea varia*, LINN. Syst. Nat. ed. 12, p. 1146.—PENN. Brit. Zool. ed. 4, vol. iv. p. 101, pl. 61, fig. 64.—PULTENEY, Hutchins, Hist. Dorset, p. 36.—DONOV. Brit. Shells, vol. i. pl. 1, f. 1.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 97.—RACK. Dorset Catalog. p. 38, pl. 10, f. 1, 2, 4, 5, 7, 9.—TURT. Conch. Diction. p. 130.—BORN, Mus. Cœs. Vind. p. 104.—POLI, Test. Sicil. vol. ii. p. 163, pl. 28, f. 10.—DILLW. Recent Shells, vol. i. p. 260.—MAWE, Linn. Conchology, pl. 14, f. 4.—Index Testaceolog. pl. 10, f. 31.

*Pecten* „ CHEMN. Conch. Cab. vol. vii. p. 331, pl. 66, f. 633, 634.—MONT. Test. Brit. p. 146.—TURT. Dithyra Brit. p. 214.—FLEM. Brit. Animals, p. 384. — MACGILLIV. Moll. Aberdeenshire, p. 224.—Brit. Marine Conch. p. 118.—LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 147.—CROUCH, Introd. Conch. pl. 12, f. 4.—SOWERBY. Conch. Manual, f. 171.—PHILIPPI, Moll. Sicil. vol. i. p. 84, and vol. ii. p. 58.—SOW. Thesaur. Conch. vol. i. p. 76, pl. 19, f. 214, 218.—HANL. Recent Shells, vol. i. p. 285, pl. 10, f. 31.

“ *monotis*, DA COSTA, Brit. Conch. p. 151. pl. 10, f. 1, 2, 4, 5, 7, 9.

Among our commonest, but likewise among our most beautiful shells, may be reckoned the *Pecten varius*, the infinite diversity of whose colouring has induced the indefatigable Gmelin to reproduce it under many appellations in his crude, but laborious compilation.* It is of an abbreviated-ovate shape, scarcely at all oblique, and almost equivalve. Both valves are moderately convex; the under, which is usually likewise the less darkly coloured, is rather the more shallow, but exhibits a sculpture in no way differing from the upper one. The general surface is radiated with numerous much-elevated ribs, ranging from twenty-five to thirty in number, but usually about twenty-eight, the profound interstices between which are nearly of the same width as the costæ, and, except when highly magnified, appear smooth: under the lens, however, they more or less distinctly exhibit very delicate striulæ, which upon the umbones are concentrically disposed, but near the lower margin run from the sides of the ribs upward in a somewhat divergent fashion, and usually form angles at their junction. The costæ are abrupt at their sides, and armed upon their rounded tops with erect and somewhat vaulted linguiform scales, which are typically rather large and not very approximate, and are usually abraded near the umbones. The auricles are similarly sculptured, but the scales upon the larger one of the under valve, are more crowded and less elevated. The inequality of the auricles is very considerable, the area of the larger (which is of rather ample dimensions) being at least thrice that of the smaller, and its upper or cardinal edge about double. The entire length of the hinge-margin is equal to, or a little more than, one-half the distance from the beaks to the opposite margin. The auricular sinus is large, subbiangulated, rather profound, and pectinated below. The angle of the larger auricle is acute, of the smaller one obtuse.

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* According to M. Deshayes, the *Ostrea muricata*, *punctata*, *aculeata*, *ochroleuca*, *mustelina*, *flammea*, *incarnata*, *versicolor*, described and named by Gmelin from almost irrecognizable figures of Gualtier, &c., all belong to this species.

The most usual painting is livid or purplish chocolate colour, rufous brown, orange, red, and yellow, generally mottled, especially towards the umbones, with cloudy patches of white, and not unfrequently in the darker examples with the echinations of a more orange tint than the prevailing ground-colour. The young are often of an uniform red, or are pale with streak-like patches of liver colour or rufous. The internal colouring is similar to that of the exterior but of a paler hue: the hinge-margin is not plicated. A beautiful lilac variety is obtained in North Britain, and a pure white one is occasionally taken in the Firth of Forth. Specimens are sometimes met with (these are usually odd valves), more than two inches and a half broad and of nearly the same length; the more common proportions (the young are always the less orbicular) are, however, an inch and a half in length, and an inch and three-quarters in breadth.

The animal has the margins of the mantle of considerable breadth; their free edges are fringed with short white tentacula, their fixed borders with both short and long ones, the latter fewest, and ranged at regular intervals. We have counted about eighteen of these long cirrhi, which are usually of a pink hue, on each mantle-margin. The mantle-margins themselves are very variable in colour, sometimes pale pink mottled with white, sometimes bright yellow speckled with orange and brown. The ocelli are black, and more numerous than the long tentacles. The body is of a pale cream or yellow hue; the branchiæ of a fawn colour. The foot is short, narrow, and white. The mantle-edges lining the auricles have short cirrhi only.

The shell is distributed all round the British coasts, in some places very abundantly, in others it is comparatively scarce, but scarcely any where gregarious. In Zetland it appears to be rare, and is on the whole more common in the south than in the north. It ranges from three to thirty-five fathoms, but is most plentiful in from seven to fifteen. It ranges throughout the European seas and is yet found rarely in the fossil state, in Pleistocene beds.

### P. NIVEUS, Macgillivray.

Free, echinated, almost always white; with from forty to fifty distinct and elevated ribs; ears unequal.

Plate L. fig. 2, and (Animal) Plate S. fig. 3.

*Pecten niveus*, MACGILLIV. Edinburgh Nat. and Phil. Journal vol. xiii. (1825), p. 166, pl. 3, f. 1.—FLEMING, Brit. Animals, p. 384.—Brit. Marine Conch. p. 250.—BROWN, Illust. Conch. G. B. p. 74, pl. 24, f. 16.—SOWERBY, Thesaur. Conch. vol. i. p. 77, pl. 19, f. 223, 224.

The general features of this shell are so very nearly identical with those of the preceding species, that it is only necessary to specify those details in which it differs. Of these, the most immediately perceptible is the much greater number of the ribs, which range from about forty to upwards of fifty, are narrower and more closely disposed, and echinated by much smaller scales, whose fragility is such that they are partially abraded on almost every specimen, and which, upon the young, are, for the most part, only visible at the extreme sides. The general shape is rather more orbicular than in *varius*, and the auricles are not so disproportionate, the area of the larger one (which is by no means of such amplitude as in the previous species) not exceeding twice that of the other, and its upper or cardinal edge not being more than half as long again (in the adult) as that of the smaller ear. The entire length of the hinge-margin, likewise, is proportionately shorter than in *varius*; and both the external and internal surfaces of the shell are in the more typical examples of a pure and uniform white.

The length of a rather large example was two inches and an eighth; its breadth was scarcely more than a line greater. The proportions are very different in the young, the breadth, in a specimen of half an inch wide, exceeding the length by about one-fifth.

The margins of the mantle are ample and of a plain white colour: near their free-edges is a row or border of very short filaments, fawn-coloured at their bases, and not extended beyond the mantle-edge; at the fixed border immediately under the edge of the shell is a range of longer and more closely set white tentacles, at the bases of which are the numerous, small, black ocelli, among which at intervals are narrow dusky blotches. The body, foot, and branchiæ are white.

*Pecten niveus* lives moored to *Laminariæ*, the old ones chiefly attached to their fronds, the young ones to their stalks, as we have seen when taking it alive in fifteen fathoms water at Oban (M'Andrew and E. F.). It was first found in the Outer Hebrides by Professor Macgillivray, who distinguished it as a species. It has not been observed out of Britain. Mr. Jeffreys has taken it in Loch Carron and various other parts of the west of Scotland.

### P. pusio, Pennant.

Affixed when adult; more or less distinctly marbled; with crowded and prickly costellar striæ, which are usually arranged so as to alternate in size; interstices extremely narrow, not squarely defined.

Plate L. fig. 4, 5, and LI. fig. 7.

Lister, An. Angl. pl. 4, f. 31; Hist. Conch. pl. 172, f. 9.

*Ostrea pusio*, Linn. Syst. Nat. ed. 12, p. 1146 (probably).—Donov. Brit. Shells, vol. i. pl. 34.

*Pecten pusio*, Penn. Brit. Zool. ed. 4, vol. iv. p. 101, pl. 61, f. 65. — Turt. Dithyra Brit. p. 215, pl. 17, f. 2. — Flem. Brit. Animals, p. 385.—Macgilliv. Moll. Aberd. p. 226. — Brit. Marine Conch. p. 119. — Sowerby, Genera Shells, Pecten, f. 6. — Philippi, Moll. Sicil. vol. i. p. 84, and vol. ii. p. 58. — Reeve, Conch. Systemat. pl. 114, f. 6. —Sowerby, Thesaur. Conch. vol. i. p. 72, pl. 14, f. 62, 63.

„ *distortus*, Da Costa, Brit. Conch. p. 148, pl. 10, f. 3, 6. — Mont. Test. Brit. p. 148, and Suppl. p. 61. — Alder, Cat. Northumb. and Durh. Moll. p. 77.—Lovèn, Index Moll. Skandin. p. 30.

*Ostrea distorta*, Pulteney, Hutchins, Hist. Dorset. p. 36.

„ *sinuosa*, Maton and Rack. Trans. Linn. Soc. vol. viii. p. 99. — Rack. Dorset Catalog. p. 38, pl. 10, f. 3, 6. — Turt. Conch. Diction. p. 130. — Dillw. Recent Shells, vol. i. p. 262.—Index Testaceolog. pl. 10, Ostrea, f. 34.

*Pecten sinuosus*, Turt. Dithyra Brit. p. 210, pl. 9, f. 5. — Fleming, Brit. Animals, p. 384.—Forbes, Malac. Monens. p. 40.—Macgilliv. Moll. Aberd. p. 225.—Brit. Marine Conch. p. 116.—Brown, Illust. Conch. G. B. p. 73, pl. 25, f. 2.—Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 148.

*Hinnites sinuosus*, Desh. Anim. s. Vert. vol. vii. p. 149, note. — Sowerby, Thesaurus Conch. vol. i. p. 79, pl. 20, f. 1, 2, 3.—Cuvier, Règne Anim. (ed. Croch.) pl. 77, f. 1. — Brod. Penny Cyclop. vol. xvii. p. 359.

„ *pusio*, Sowerby, Conch. Manual, f. 173.

*Pecten Isabellæ*, (fry.) Macgilliv. (not Lam.) Moll. Aberd. p. 225 (fide Jeffreys from type).—Brit. Marine Conch. p. 250 (copied).—Brown, Illust. Conch. G. B. p. 132 (do).

„ *spinosus*, Brown, Illust. Conch. G. B. p. 73, pl. 24, f. 8.

„ *striatus* (fossil) Sow. Min. Conch. pl. 394. f. 2, 4.

The habits and appearance of this *Pecten*, which we have not ventured to call the *pusio* of Linnæus, although we believe it to be so, vary so greatly with age, that its former division into two or more species can excite but little surprise and less reprehension. In the young it is free and regular, but when mature becomes attached and, from adapting its growth to the circumstances of its abiding-place, distorted. Consequently it is rather from the younger, than from the more aged examples, that, contrary to the ordinary rule, we must derive the characteristics of the species. At the former stage the contour, which in the adult is often orbicular, is manifestly broader than long, and the hinder auricle is only about half the length of the very large anterior one; whereas in old shells, the auricles, being dependent upon situation for their developement, are occasionally small, and sometimes, the growth being checked in front but permitted behind, are of almost equal dimensions. The colouring is very variable: at times the exterior is entirely red or white, at times marbled with patches of either tint; frequently this painting lingers upon the umbones, whilst the lower disk is either mottled or marked with wavy patches of nut-brown, or brownish liver-colour, on a whitish ground; more usually, however, the umbones do not differ in their painting from the rest of the surface. That which peculiarly distinguishes the species is its sculpture; this, however, is wholly obsolete, save on the free umbones, in the attached lower valve, which moulds itself to the peculiarities of the rock or shell to which it is affixed, and is consequently almost invariably distorted and sinuous in appearance; the form of the upper valve assimilates itself likewise to that of the lower, and exhibits corresponding gibbosities and indentations: the portion actually attached is destitute of colour. Extremely numerous costellæ (we have counted as many as forty in the young, and may say nearly twice that number for the adult), armed more or less closely with fragile laminar spines and vaulted or prickly scales, radiate from the umbones to the ventral margin, intermediate smaller ones starting up in the interstices directly the divergence of the larger ones permits their developement. An alternation of larger and smaller costellæ is thus established. The interstices, previous to the commencement of the intermediate little ribs, exhibit, when perfect, somewhat concentric laminar wrinkles, but no microscopic chasing discovers itself under a lens of high power. The ears are well defined below, and densely covered with echinated costellæ; the auricular sinus is subbiangulated, rarely profound or large in the adult, but almost always more or less indicated; typically the cardinal angle of the front auricle is acute, of the hinder one obtuse. An example that measures two inches or an inch and three-quarters in width may be regarded as a large individual, the majority of specimens not averaging an inch and a half. It is difficult to determine which valve is the less shallow (neither is very convex, and both are moderately strong); but the upper is generally regarded as rather the flatter. The interior, which is not at all nacreous, is either white or partakes of the external colouring.

The animal is very similar to that of *P. varius;* the long cirrhi of the fixed margins of the mantle appear to be longer and the eyes rather larger than in that species. The mantle is most usually of a yellow hue, mottled or blotched with brown; the branchiæ of a fawn-colour, and the body of a pale pink tint.

It is generally distributed around our coast, ranging from low-water mark, where it occurs at Herm attached to the under-surface of rocks, whilst the young are free in the neighbouring pools—(S. H.)—to a depth of fifty, sixty, and even ninety fathoms, as we have found it in the Hebrides and Zetlands (E. F.) It is most plentiful in from fifteen to twenty-eight fathoms. The young ones seem to be always free or moored by their byssus to corallines and sea-weeds, and old examples almost always attached, gluing their valves, by a process as yet not understood, to the surfaces of stones, shells, and laminaria-roots, and assuming consequently strange distortions of shape.

It ranges throughout the European seas, and is found fossil in the Upper Tertiaries of England.

### P. STRIATUS, Müller.

Suborbicular, transparent, not ribbed; with minutely squamiferous radiating costellar striæ; ears not very unequal, the auricular sinus distinct.

Plate LI. fig. 1 to 4, and (Animal) Plate S, fig. 2.

*Pecten striatus*, MÜLLER, Zool. Danic. pl. 60, f. 3 to 5.—ALDER, Cat. Northumb. and Durh. Moll. p. 77.—LOVÈN, Index Moll. Scandinav. p. 31.
*Pallium vitreum* (partly), CHEMN. Conch. Cab. vol. vii. p. 335, pl. 67, f. 637, b. c.
*Ostrea fuci*, GMELIN, Syst. Nat. p. 3327.—DILLW. Recent Shells, vol. i. p. 258.—Index Testaceol. pl. 10, f. 27? (copied from Pecten reticulatus, Chemn. Conch. cab. vol. xi. (p. 263) pl. 207, f. 2039, 2040.)
*Pecten aculeatus*, JEFFREYS, Conch. and Malacolog. Magaz. vol. i. p. 40.—Brit. Marine Conch. p. 249, f. 30.—SOWERBY, Thesaur. Conch. vol. i. p. 71, pl. 13, f. 47.
" *Landsburgi*, SMITH, Mem. Werner. Soc. vol. viii. p. 106, pl. 2, f. 2.—BROWN, Illust. Conch. G. B. p. 73, pl. 25, f. 8.—HANL. Recent Shells. vol. i. p. 282.
" *fuci*, THOMPSON, Ann. Nat. Hist. vol. xviii. p. 385.
" *rimulosus*, PHILIPPI, Moll. Sicil. vol. ii. p. 60 (fossil)?
" *spinosus*, JOHNSTON, Trans. Berwick Nat. Club.

This beautiful and fragile bivalve is of such extreme tenuity as to be often actually transparent. Its shape is nearly circular, but rather broader than long; its posterior side is decidedly the shorter; there is, however, no marked bulging out at the hinder extremity. The valves are shallow, but nearly equally convex; their exterior is shining, and microscopically chased with dense and peculiarly irregular divergent wavy radiating striulæ, which, when examined under a very powerful glass, often appear subarticulated. The upper valve (whose colouring is likewise the darker) exhibits also very numerous but not much elevated striæ, which run from the beaks to the ventral margin, and are echinated (at least in the younger specimens) by short broad and minute prickly scales, which are most apparent towards the lower margin, but, where abraded, show traces of their former presence by the somewhat articulated or catenulated appearance of the striæ. This sculpture, which extends likewise to the auricles, is obsolete or very obscure upon the lower valve, where microscopic concentric lines more or less decussate and shagreen the minute striulæ. The colouring and style of painting is not unlike that of *tigrinus*, consisting of whitish streaks, clouds, or spots, on a ground of brownish or somewhat livid red, varying in intensity from chocolate to pale brownish flesh-colour; snow-white flakes or minute specks occasionally augment the beauty of the pattern. There exists also (as in most *Pectens*) a colourless variety. The dorsal slopes are incurved and rather short; the hinge-margin, which is almost invariably equal to half the length of the shell, often exceeds that proportion; the ventral margin is rather broadly rounded (in the adult); the apices of the valves acute and prominent. The auricles, which are well defined in both valves, are very unequal. The posterior one, although not very small, is only half as long as the other; its base, however, reaches as low down as that of the hinder one; its angle is decidedly obtuse; its side straightish, and occasionally slightly convex. The anterior auricle is decidedly large, but very manifestly shorter in the upper valve; its angle is a right angle, and its sinus rather large, profound, finely pectinated, and angular below. The interior of the shell displays no peculiarity in hinge or painting; the latter, from the thinness of the shell, being that of the exterior; the margin is quite entire.

Our largest specimen measured ten lines in width, and was slightly inferior (not quite a line) in length; the middle-aged examples are the more orbicular.

The animal has a white-margined mantle, marked with distant perpendicular stripes of Sienna-yellow; on the fixed edges of the mantle-margins are the white cirrhi, and among their bases conspicuous blue-black ocelli, which, when very highly magnified, are seen to have crimson centres; the shorter cirrhi at the free edge of the mantle are white. The branchiæ are yellowish-white, and the body is of a bright orange-yellow.

This pretty shell, first described as British by Mr. Smith of Jordan Hill, and named by him after our esteemed friend, the Rev. David Landsborough, appears to have been formerly confounded on our shores with *tigrinus*. It is a species of boreal origin, and consequently most common on the Scottish shores, and near the outliers of the glacial sea. On the English coast it is very rare, but has been taken off Scarborough (Bean); in thirty fathoms, thirty-five miles off Northumberland (King); in fifty fathoms, on the same coast (Howse); at Whitburn (Abbes); and Newton (Embleton). On the west coast of Scotland it is frequent in the Clyde district and the Hebrides; it occurs also among the Zetlands and Orkneys. The following Scottish localities will show its range:—Orkney, twelve fathoms; Oban and Skye, in twenty fathoms; off Copenhaw Head and Loch Ranza in forty fathoms. Ten miles from Fair Isle in sixty fathoms. In fifty fathoms moored to stones on the Ling banks forty miles to the west of Zetland. In ninety fathoms off Mull (M'Andrew and E. F.).

On the Irish Coast it has been taken in Strangford Lough (W. Thompson and Hyndman); in Birterbuy Bay on the west coast (Barlee); on rocky ground east of Cape Clear in from forty to forty-five fathoms (M'Andrew); and from the Nymph Bank (Warren). It ranges along the Scandinavian shores to Finmark (Lovèn).

The *Pecten furtivus* of Lovèn (Index Moll. Skandinav. p. 31) has been dredged in Zetland; at Lerwick in forty and fifty fathoms (Jeffreys); Loch Fyne (M'Andrew); Galway (Barlee); and Exmouth (Clark). It differs from the typical *striatus* in being suborbicular, and usually of a more opaque texture; is either without the aculeated striæ, or has fewer and only displays them fully at the sides and near the margin. Its microscopic chasing, likewise, is much more regular (as in *tigrinus*), and in most examples is closely decussated by concentric lines. The front auricle of the upper valve is somewhat incurved at its base, and above is very nearly coextensive with that of the under one; whilst in the typical form the entire lateral edge of the superior front auricle is comparatively straight, and above exhibits the opposing auricle stretching out beyond it. All these characters are rarely present in the same example, and indeed blend so imperceptibly with the normal features of *striatus*, that we are not prepared, after having observed the remarkably wide range of variation permitted to its British congeners, to accede at present to its separation from that species.

### P. TIGRINUS, Müller.

Decidedly broader than long, with or without radiating folds, never echinated; one of the ears almost rudimentary.

Plate LI. fig. 8 to 11.

*Pecten tigrinus*, MÜLLER, Zool. Dan. pl. 60, f. 6, 7, 8.—ALDER, Cat. Moll. Northumb. and Durham, p. 77.—DESH. Anim. s. Vert. vol. vii. p. 155.—LOVÈN, Index Moll. Scandinav. p. 31.

„ *obsoletus*, PENN. Brit. Zool. ed. 4, vol. iv. p. 102, pl. 61, f. 66.—DONOV. Brit. Shells, vol. i. pl. 1, f. 2.—MONT. Test. Brit. p. 149, and Suppl. p. 57.—TURT. Dithyra Brit. p. 213, pl. 9, f. 6.—FLEMING, Brit. Anim. p. 385.—MACGILLIV. Moll. Aberd. p. 226.—Brit. Marine Conch. p. 118.—BROWN, Illust. Conch. G. B. p. 72, pl. 24, f. 6.—SOWERBY, Thesaur. Conch. vol. i. p. 71, pl. 14, f. 74, 75, 79.—HANL. Recent Shells, vol. i. p. 282, pl. 10, f. 37.

„ *lævis*, PENNANT, Brit. Zool. ed. 4, vol. iv. p. 102.—MONT. Test. Brit. (not Suppl.) p. 150, 579, pl. 4, f. 1.—TURT. Dithyra, Brit. p. 212.—Brit. Marine Conch. p. 117.—BROWN, Illust. Conch. G.B. p. 72, pl. 24, f. 7.

„ *parvus*, DA COSTA, Brit. Conch. p. 155.

*Ostrea tigrina*, GMELIN, Syst. Nat. p. 3327.—DILLW. Recent Shells, vol. i. p. 258.—Index Testaceolog. pl. 10, f. 26.

*Pecten domesticus*, CHEMN. Conch. Cab. vol. xi. p. 261, pl. 207, f. 2031 to 2036.

*Ostrea obsoleta*, MATON and RACK. Trans. Linn. Soc. vol. viii. p. 100.—TURT. Conch. Diction. p. 133.—DILLW. Recent Shells, vol. i. p. 263.—Index Testac. pl. 10, f. 37.—MAWE, Linn. Conchol. pl. 14, f. 6.

„ *lævis*, MATON and RACK. Trans. Linn. Soc. vol. viii. p. 100, pl. 3, f. 5.—DILLW. Recent Shells, vol. i. p. 263.—Index Testaceolog. pl. 10, f. 38.

*Pecten Armoricanus*, CHENU, Ill. Conch. Pecten, pl. 39, f. 1, 2, 3.

As this shell exhibits the strange phenomenon of being sometimes smooth, at other times most distinctly ribbed, it was naturally divided into two or more species at a period when, the conchological fauna of North Britain being but little known, the *Pecten tigrinus* was considered one of our scarcest shells. The zealous labours of many naturalists in the Northern portion of our Islands, and the much more frequent use of the dredge, have rendered this bivalve a comparatively common one, and furnished us with connecting links between the two chief varieties.

The shape is suborbicular, but rather broader than long, the texture moderately strong, and the surface dull, or scarcely at all shining. Both valves are convex (yet not quite equally so), and typically rather compressed; they are alike in sculpture, and frequently in colouring also. The exterior appears, under the lens, to be covered with most minute subradiatingly divergent curved wavy striulæ, which again, under a still higher power, exhibit microscopical concentric lines (especially in the more convex valve), decussating them either wholly or at the sides. Sometimes the surface is otherwise smooth, sometimes there is a marginal belt of narrow and very closely disposed depressed radiating costellæ; occasionally these latter extend over the whole shell with or without the presence of about five principal radiating ribs, which are rounded, generally broad, and variable in amount of elevation. At times the costæ are alone present, the costellæ, or raised sulci, being obsolete; more frequently two or three of these intervene between each rib. The auricles are excessively unequal, well defined, scarcely subrectangular, costellated, unarmed, and sometimes latticed; the anterior one is large; the posterior one, whose upper edge is not half the length of the front one, is almost rudimentary. The auricular sinus is very narrow, forming a very acute angle at its summit; it is not very profound, and is very delicately pectinated below. The hinge-margin is found, when measured, to be equal to half the width of the shell, though scarcely appearing so to the eye. The dorsal edges are rather long and much sloping. The interior is usually of a whiter cast than the external colouring: its hinge-margin is not peculiarly plicated: its rim is almost always crenated.

The painting is very beautiful, and displays an infinity of patterns; the mass of individuals, however, are of a brownish red, and usually mottled or variegated with whitish patches, streaks, spots, festoons, clouds, or specks, occasionally also with chocolate-coloured rays or stains, and generally with a brighter orange-red tint upon the acute beaks. One of the most beautiful specimens we possess is of an uniform lilac tint in one valve and snowy white upon the other; in another specimen wavy fillets of livid red encircle the more convex of the two white valves; in a third individual three yellow rays are apparent upon a ground of purplish liver-colour. A very charming and rare variation displays linear fillets of white upon a ground of reddish chocolate colour.

One of our larger specimens measured nearly an inch in breadth, and only one line less in length; three quarters of an inch, however, is a fair average width for examples. We may remark, also, that in the ribbed variety, the lower margin is so waved as occasionally to become pentagonal; and sometimes is so suddenly bent in, that the shell assumes the appearance of a shallow box.

The animal has a white margined mantle, mottled with dusky or brown rays. The ocelli are brown. The body is usually of a bright red colour, occasionally of a creamy white. It is a favourite food of flat-fish.

This pretty shell is found on all our coasts, though much scarcer in some localities than in others. It ranges from twelve to sixty fathoms, frequenting sea-bottoms of shells, gravel and sandy mud. In from eighteen to twenty-five fathoms is its favourite depth.

It ranges throughout the Celtic and North European seas, and is found fossil in the red and mammaliferous crags.*

## P. DANICUS, Chemnitz.

With from four to ten radiating folds; white, or speckled with white on a ruddy ground: hinder auricle not obsolete, at least equal in length to half the anterior one, when small forming an acute angle.

Plate LII. fig. 1, 2, 7, 8, 9, 10.

*Pecten septemradiatus*, MÜLLER, Zool. Dan. Prodromus (1776), No. 2992 (fide Lovèn, p. 31).

„ *triradiatus*, MÜLLER, Prodromus and Zool. Dan. vol. ii. p. 25, pl. 60, f. 1, 2 (fide Lovèn and Chemn.).

*Pseud-Amusium*, CHEMN. (not Klein) Conch. Cab. vol. vii. (1784), p. 298, pl. 63, f. 601, 602.

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* We are at a loss to discover what was regarded by Montagu in his Supplement (p. 61.—FLEMING, Brit. Anim. p. 385.—*Ostrea lævis*, TURT. Conch. Dict. p. 131.) as the *P. lævis* of Pennant, which latter is thus imperfectly characterised:—" Both shells convex, with unequal ribbed ears; the rest of the shell entirely smooth, very small—Anglesea:" and is probably *tigrinus* of this work. It appears that the author of the " Testacea Britannica" possessed two specimens, the larger of which, measuring slightly more than half an inch, was taken in Falmouth Harbour, (this was possibly exotic, for the locality is a suspicious one,) the smaller (and this was possibly the fry of *P. maximus*, or some other indigenous species, and not the individual described) from the coast of Devon among Sertulariæ and Nullipores. He states that the shell was nearly equal in length and breadth, so thin as to be semitransparent, was whitish or of a pale ash-colour, not shagreened, but quite smooth, except the mere wrinkles of increase, and had one of its auricles of ample magnitude, whilst the other was small and a little striated in a longitudinal direction. However insufficient this language proves for indicating with any certainty what particular species was meant out of the hundred or more known members of the genus, it nevertheless describes features which are not combined in any native shell we are acquainted with. Some naturalists have surmised that it was the *similis* of Laskey, but that gentleman expressly declares (Mem. Wern. Soc. vol. i.) that the reception of a specimen from Montagu (a third or one of the original types?) had dispelled his previous conjecture of the specific identity of the two shells: moreover, the very different auricles forbid this hypothesis,—in truth, a worn *tigrinus* would agree far better with the brief diagnosis.

*Ostrea hybrida*, Gmelin, Syst. Nat. (1788), p. 3318 (not synonymy; from Chemnitz, f. 601, 602).
„ *triradiata*, Gmelin, Syst. Nat. p. 3326.—Dillw. Recent Shells, vol. i. p. 264. (Both from Müller).
„ *septemradiata*, Gmelin, Syst. Nat. p. 3327 (from Müller).
*Pecten Danicus*, Chemn. Conch. Cab. vol. xi. (1795) p. 265, pl. 207, f. 2043.—Sowerby, Thesaur. Conch. vol. i. p. 61, pl. 12, f. 16, and pl. 17, f. 187.—Hanl. Recent Shells, vol. i. p. 277.
*Ostrea inflexa*, Poli, Test. Siciliæ, vol. ii. p. 160, pl. 28, f. 4, 5 (probably).
„ *clavata*, Poli, Test. Siciliæ, vol. i. p. 161, pl. 28, f. 17 (probably).
„ *corallina*, Poli, Test. Sicil. vol. ii. p. 164, pl. 28, f. 16 (probably).—Costa, Test. Sicil. p. 51 (do.).—Dillw. Recent Shells, vol. i. p. 255 (from Poli).
*Pecten adspersus*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 136.—Jeffreys, Ann. Nat. Hist. vol. xix. p. 313.—Philippi, Moll. Sicil. vol. i. p. 82, and vol. ii. p. 57.
„ *pes-felis*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 140 (in part, not synonyms)?—Jeffreys, Ann. Nat. Hist. vol. xix. p. 313.—Philippi, Moll. Sicil. vol. i. p. 84, and vol. ii. p. 58 (probably; but not synonyms).
? „ *glaber*, Mont. Test. Brit. Suppl. p. 60.—Turton, Dithyra Brit. p. 211.—Brit. Marine Conch. p. 117.—Fleming, Brit. Animals, p. 384.—Brown, Illust. Conch. G. B. p. 73, pl. 25, f. 3, 4.
? *Ostrea glabra*, Turton (not Linn.) Conch. Diction. p. 132.
*Pecten Dumasii*, Payraudeau, Cat. Moll. Corse, p. 75, pl. 2, f. 6, 7.—Jeffreys, Ann. Nat. Hist. vol. xix. p. 313.
„ *nebulosus*, Brown, Edinb. Journl. Nat. Hist. (ed. Macg.) vol. i. (Nov. 1835), p. 9, f. 1; Illust. Conch. G. B. p. 72, pl. 22, f. 17.
„ *Jamesoni*, Smith, Memoirs Werner. Soc. vol. viii. p. 106, pl. 2, f. 1.—Brown, Illust. Conch. G. B. p. 73, pl. 25, f. 7.
Encyclopédie Méthodique, Vers., pl. 212, f. 6.

Following the example of Dr. Philippi, but after a long and independent scrutiny, we have united under this epithet forms and sculpture so apparently distinct that he who possesses the more characteristic examples of each variety, yet owns not likewise those intermediate links, whose existence, an examination of all the great cabinets of England has enabled us to ascertain, will assuredly dissent from our conclusion.

The colouring, which pervades all the varieties (the albino excepted), is of a lighter or darker brick or ruddy flesh-colour, diversified in the more characteristic specimens with pale or whitish markings, which vary infinitely in number, size, shape, and conspicuousness. This painting is generally replaced in the lower valves by a white or paler tint, usually, however, displaying the more characteristic painting upon the umbones and costal interstices. A peculiar dull pearly-white gloss distinguishes the interior of the more mature individuals; the younger shells, from their thinness, exhibit more or less of the external hue and pattern. The valves are more or less round, rather thin, moderately and nearly equally convex, and rayed with from four to ten (five or seven are the most usual) unarmed rounded and unequal ribs, which vary much in elevation, expansion, and distance from each other, but are commonly more abrupt and angular above, more dilated and depressed below. In the thinner and more ordinary form (of this a live but perfectly colourless individual is in the cabinet of Mr. Barlee) the surface is smooth, and the shape, owing to the bulging out of the lower posterior portion, is inequilateral and oblique; the ribs are usually six or seven in number, and owing to the gentle declination of their sides give an undulating appearance to the exterior. The dorsal slopes are but trifling, and the general contour nearly circular; the auricles are comparatively subequal, rather large, inclined to be rectangular, and smooth or striated; the sinus is short, shallow, and scarcely angular. Certain individuals of this form exhibit under the microscope a sculpture analogous to that of *tigrinus*, but still more minute, with the radiating lineoles less divergent, and the concentric wrinkles more conspicuous. We regard these, however, as exceptional.

The variety *Dumasii* is so aberrant, that it was only after protracted scrutiny and the comparison of many specimens, that we ventured to decide upon uniting it with the more typical form. It is almost invariably smaller, with its surface wholly or partially sculptured with radiating striæ; its ribs, which are more frequently five than six in number, strongly, and rather abruptly elevated, and its hinder auricle very decidedly the smaller one. In some of the younger individuals, the very delicate wavy concentric elevated wrinkles which cross the striæ, give a slightly squamular or at times a subcancellated appearance to the shell. The white speckles are not so diffused as in the previous form, but are generally visible on one, at least, of the umbones. In the very beautiful example figured (belonging to Mr. Barlee, whose indefatigable exertions in collecting, have rendered many of our once scarcer species comparatively common), some of the interstitial striæ are crested with small spinous scales.

Intermediate between the two, comes a third variation, which more closely approaches the former, but differs in being stronger, more equilateral, and more frequently striated; its ribs are more prominently defined (and in the young are subangular); its dorsal slopes more rectilinear; its hinder auricle, likewise, is rather smaller in proportion, more incurved laterally, and with its sinus (in the young) more angulated and better indicated.

A moderately sized specimen of the typical form measured an inch and five lines in length, and an inch and six lines and a-half in breadth: its hinge-margin was equal to exactly one-half the length of the shell. The dimensions of the largest individual noticed by us, of the second variety, were an inch and three lines for the length, and one line more for the breadth; the hinge-margin measured under seven lines, thus causing the auricles to be shorter in proportion to the general area.

The *Pecten glaber* of Montagu,* taken by Mr. Laskey near Dunbar, agrees better with this than with any other of our known native species; neither figure (Suppl. pl. 28, f. 6) nor description (both, we believe, taken from a single valve) being absolutely at variance with one of the many varieties of this polymorphous shell. So many of the supposed Dunbar species having turned out to be foreign, this too may possibly prove an exotic *Pecten;* nevertheless, we cannot, after studious examination, ascribe the species in question, with positive certainty, to any member of this extensive genus. As to the *glaber* † of Pennant (Brit. Zool. ed. 4, vol. iv. p. 102; copied, Mont. Test. Brit. p. 150), his description is so brief and inadequate, that unaccompanied as it is with any representation, its determination must be purely conjectural; it certainly does not appear to be identical with that of Linnæus, which is a well known species of the Mediterranean.

This beautiful shell was first announced with certainty as a British species by Captain Thomas Brown, who described it, and exhibited specimens from the Clyde, at the Edinburgh meeting of the British Association. It has since been taken by Mr. Smith, Mr. M'Andrew, Mr. Jeffreys, Mr. Barlee, and others, in many localities among the Hebrides. The following will show its range in depth. Lismore and south of Skye in twenty fathoms; Armadale in twenty-five fathoms; Loch Fyne and Loch Ranza in forty fathoms; Mull, in ninety fathoms. Off both east and west coasts of Zetland it has been taken in eighty, and in one instance at the depth of one hundred fathoms (M'Andrew). The variety *Dumasii* has been taken in Skye (Jeffreys), and Oban (Barlee).

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* "Mottled with rufous brown and yellow, thin, and nearly smooth, but not glossy; it has seven rounded rays, not much elevated: the ears are nearly equal, and large, one is reticulated, the other only striated. The inside is singularly marked with twenty-one slender rays, the sixteen middle ones are placed in fours; that is to say, there are four rays between the sulci that form the rays on the outside, and the two middle of these series of quadruplicate rays approximate; the others are remote: the colour is paler than the outside, except at the upper part about the hinge. Length, three quarters of an inch, breadth rather less. In the specimen before us there is some slight appearance of intermediate rays in the depressions that separate the evident ones, and which are formed by the sulci between the approximate rays on the inside. Those who are fortunate enough to obtain the shell will observe by the assistance of a pocket lens, that it is most minutely striated concentrically, but does not possess any longitudinal striæ, like *P. obsoletus.*" (Mont. Test. Brit. Suppl. p. 60.)

† "P. with a very thin shell, fifteen faint rays, equal ears. The inner side of the shells marked with rays, divided by a single sulcus. Anglesea. A scarce species. Small."

It is found on the shores of Scandinavia, and in the Mediterranean.

### P. SIMILIS, Laskey.

Minute, longer than broad, quite smooth, bulging out at one of the sides.

Plate LII., fig. 6, and (animal) Plate S, fig. 1.

*Pecten similis*, LASKEY, Mem. Werner. Soc. vol. i. p. 387, pl. viii. f. 8.—FLEMING Brit. Animals, p. 385.—MACGILLIVR. Moll. Aberd. p. 227.—BROWN, Illust. Conch. G. B. p. 73, pl. 25, f. 5, 6.

*Ostrea tumida*, TURT. Conch. Diction. p. 132.

*Pecten tumidus*, Turt. Dithyra Brit. p. 212, pl. 17, f. 3.—FLEMING, Brit. Anim. p. 384.—BROWN, Illust. Conch. G. B. p. 73.—HANL. Recent Shells, vol. i. p. 275.—LOVÈN, Index. Moll. Scand. p. 32.

This little bivalve may readily be distinguished from the other smooth British *Pectens*, by its length being at least equal to its breadth. It is small, suborbicular, very thin and fragile, transparent, compressed, and more or less shining; the valves, though equal to each other in convexity, are scarcely of the same breadth, the upper, for the most part, projecting rather beyond the ventral margin of the lower valve. The painting of the upper valve is variable, yet usually consists of bright red markings upon a pale or yellowish-white ground, exhibiting some diversity of arrangement, and very often displaying a mottled appearance, with frequently, too, a few narrow interrupted rays of blood-red and occasionally opaque white amorphous patches. Sometimes the pattern is composed of white and scarlet zigzags disposed somewhat concentrically upon a pale horn-coloured ground. The lower valve is either whitish or faintly exhibits the hues of the superior one. Neither striæ, ribs, radiating folds, nor microscopic chasing are visible, the entire surface being perfectly smooth, with, at most, faint indications of concentric lineoles. The sides are unequal; the anterior is the more produced, and slightly the narrower at its projecting termination; the posterior is the shorter and the more broadly rounded at its extremity. The auricles are rather large and not very unequal, have their lateral edges convex, and their upper angles, which are both of them rounded off, rather more than right angles. The hinder ears are not well defined at their commencement: that of the upper valve, although larger in area, scarcely surpasses the other in length; the front one of the superior valve rather curls upward at its top. The auricular sinus is small and rather shallow, but acutely angular below, and well indicated. The hinge-margin is very long, being considerably more than half the length of the shell. The extension of the posterior auricle causes the lateral outline of that side of the shell to appear peculiarly abrupt and but little indented, the outline of the ear being united to that of the body in almost a continuous curve.

Few of our British specimens measure much more than a quarter of an inch in diameter. The *P. Greenlandicus* of Sowerby (Thesaur. Conch. vol. i. p. 57, pl. 13, f. 40) is very closely allied to this species.

The animal has a fawn-coloured mantle marked with patches and lines of orange and black; the edges nearest the shell are furnished with white or pale-yellowish cirrhi, rather thick and long in proportion to the size of the species. The ocelli are large, distant, and comparatively few, pearly and ringed with jet. The body and foot are of a brilliant orange, and the branchial leaflets are lineated with black. It is a very active and irritable creature jumping and swimming about in confinement with great vivacity. All its activity is needed to enable it to escape from its enemies, since haddocks greedily devour it.

This pretty little Pecten was first observed by Laskey, who took it in the Frith of Forth. A slight variety taken by Turton attached to a *Serpula tubularia* in Torbay, was named by that author *P. tumidus.* It has since been found in many localities, usually in deep water; Penzance, alive in twenty fathoms, and Plymouth in twenty-five fathoms (M'Andrew and E. F.). Isle of Man, moored to corallines in twenty-five fathoms (E. F.). Taken from the roots of corallines on the Northumberland and Durham coasts (A. Hancock). In twenty-five fathoms, stony ground, Coquet and northwards to sixty fathoms off Trouphead, where they are numerous and free (Thomas). In numerous localities among the Hebrides, in from eighteen to fifty fathoms water, also in Zetland (M'Andrew and E. F.). Off Lerwick in forty fathoms; at Ullapool off Skye, and in Loch Fyne (Jeffreys). In four fathoms, Shapinsha, moored to corallina, among thousands of Rissoæ, and in two fathoms, Stromness, moored to *D. aculeata* (Thomas; who observes that they can quit their moorings when they like). Off Cape Clear in sixty fathoms (M'Andrew); off entrance of Belfast Lough in thirty to thirty-five fathoms (Thompson.) It ranges throughout the European seas, and is found fossil in the coralline crag (Wood).

### P. MAXIMUS, Linnæus.

Very inequivalve; upper valve concave at the umbones; under valve very convex.

Plate XLIX.

LISTER, Anim. Angl. pl. 4, f. 29; Hist. Conch. pl. 163.—KNORR, Delices des Yeux, pt. 2, pl. 14, f. 1.

*Ostrea maxima*, LINN. Syst. Nat. p. 1144; Fauna Suecica, p. 520.—PULTENEY, Hutchins, Hist. Dorset, p. 35.—DONOV. Brit. Shells, vol. ii. p. 49.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 96; Dorset Catalog. p. 37, pl. 9, f. 3.—TURT. Conch. Diction. p. 128.—BORN, Mus. Cæs. Vind. p. 98.—DILLW. Recent Shells, vol. i. p. 247.—Index Testaceolog. pl. 10, f. 1.

*Pecten maximus*, PENN. Brit. Zool. ed. 4, vol. iv. p. 99, pl. 59, f. 61.—MONT. Test. Brit. p. 143.—TURT. Dithyra Brit. p. 207.—FLEMING, Brit. Anim. p. 383.—MACGILLIV. Moll. Aberdeens. p. 223.—Brit. Marine Conch. p. 115.—BROWN, Illust. Conch. G. B. p. 71, pl. 25, f. 1.—CHEMN. Conch. Cab. vol. vii. p. 268, pl. 60, f. 585.—LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 129.—CROUCH, Introd. Lam. Conch. pl. 12, f. 3.—SOWERBY, Thesaur. Conch. vol. i. p. 45, pl. 15, f. 98 to 100.—HANL. Recent Shells, vol. i. p. 268, pl. 10, f. 1.

" *vulgaris*, DA COSTA, Brit. Conch. p. 140, pl. 9, f. 3.

" *lævis*, MACGILLIV. Moll. Aberdeen. p. 227 (probably).

The great edible Scallop is a large and handsome shell. It is suborbicular, strong, occasionally heavy, and very inequivalve; the lower valve being ventricose, whilst the upper one is shorter at the ventral margin, flat but depressed at the umbo in the adult, and entirely concave in the young. From about fourteen to sixteen broadish and rounded ribs diverge from the umbo of the lower or more convex valve; these are but moderately elevated, and are rather wider than their interstices, which are simply concave, and, equally with the costæ, sculptured with large and distinct elevated radiating striæ. These latter, however, are entirely absent upon the umbones of the adult, and are not developed in the younger shells. Similar striæ appear upon the flattened valve, but, together with the costæ, disappear upon the depressed umbo. As the flat interstitial spaces of the upper valve correspond to the broad ribs of the lower one, the converse of the relative proportions of ribs and interstices here prevails, the former (whose sides are abrupt, and whose tops are but slightly rounded) being much narrower than the latter, where the delicate crowded lamellar striulæ, which concentrically traverse the shell, are chiefly manifest.

The auricles are rather large, very nearly equal, subrectangular, convex in the ventricose valve, concave in the flat one: in addition to their concentric lamellar striulæ they are merely radiated with fine unarmed costellæ or coarse elevated striæ. The auricular sinus is nearly obsolete. The hinge-margin is almost level, but rises slightly on either side of the beaks in the upper valve; it is equal in the young to two-thirds the breadth of the shell, and even in the adult is more than equal to half the length, which latter is considerably superior to the breadth of the valves.

The prevailing tint of the flatter valve is rufous, with some small angular markings of a darker hue upon the ribs; the umbo is of a yellowish white, or pale orange. The convex valve is almost white; sometimes too, towards the umbo, of a roseate flesh-colour, marbled with flexuous linear veins of white, and cinctured with two fillets of dark red angular markings. In the young, this valve is usually orange, pink, or flesh-coloured, not unfrequently, likewise, lineated or variegated with white. The interior of both valves is generally pale, and bordered with reddish chocolate colour.

Six inches in length, and five in breadth, is about the average size of full-grown examples.

The pendant borders of the mantle in the animal of *maximus* are variously marbled and mottled with brown, black, and white. Their fixed edges are fringed with a triple row of rather long filaments, which are lineated above with brown; one of the rows is less thickly set and longer than the rest; similar but rather shorter cirrhi fringe the free edges. The ocelli are of a greenish blue or purplish hue. The branchiæ are of an orange fawn colour. The body is pinkish white above, bright red or pink in its free portion.

This fine species, though generally distributed through our seas, is only locally abundant, and cannot be said to be ever truly gregarious. It has a range of from three to forty fathoms, occurring most frequently in from fifteen to twenty-five fathoms, and most abundantly on the banks of *Pecten opercularis*. It appears to be most scarce on the east coast of England. Mr. Bean states that he has taken only three alive during very many years at Scarborough. It is much sought after for food, and is a constant visitant of the London markets. Scalloped with bread crumbs in its own shell, or fried with a little vinegar and pepper, it forms a very delicious morsel; it has the sweet flavour which characterizes all the scallops. The deep valves of the shell are much used to contain scalloped oysters, and, in fishermen's huts, for rude but useful lamps. It ranges all along the Atlantic shores of Europe from Norway (Lovèn) to Gibraltar (M'Andrew). As a fossil it occurs, though rarely, in the northern drift.

### P. opercularis, Linnæus.

Subequivalve, suborbicular, rather strong, rarely speckled; folds about twenty; surface minutely radiated with closely disposed rows of scales; ears nearly equal.

Plate L. fig. 3; LI. f. 5, 6; LIII. f. 7.

List. Historia Conch. pl. 190, 191.—Knorr, Délices des Yeux, pt. v. pl. 28, f. 4.

*Ostrea opercularis*, Linn. Syst. Nat. p. 1147.—Pulteney, Hutchins, Hist. Dorset, p. 36.—Maton and Rack. Linn. Trans. vol. viii. p. 98; Dorset Catalog. p. 38, pl. 9, f. 1, 2, 4, 5.—Turt. Conch. Diction. p. 129, f. 74.—Born, Testacea Mus. Cæs. Vind. p. 106.—Schröter, Einleit. Conch. vol. iii. p. 317, pl. 9, f. 3.—Gmelin, Syst. Nat. p. 3325.—Dillw. Recent Shells, vol. i. p. 266.—Index Testaceolog. pl. 10, f. 43.

" *subrufa*, Penn. Brit. Zool. ed. 4, vol. iv. p. 100, pl. 60, f. 63.—Donov. Brit. Shells, vol. i. pl. 12.

*Pecten pictus*, Da Costa, Brit. Conch. p. 144, pl. 9, f. 1, 2, 4, 5.

" *lineatus*, Da Costa, Brit. Conch. p. 147, pl. 10, f. 8.—Mont. Test. Brit. pp. 147, 579.—Fleming, Brit. Anim. p. 383.—Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 143.

" *opercularis*, Chemn. Conch. Cab. vol. vii. p. 341, pl. 67, f. 646.—Mont. Test. Brit. p. 145.—Turt. Dithyra Brit. p. 209.—Fleming, Brit. Anim. p. 383.—Macgilliv. Moll. Aberd. p. 224.—Brit. Marine Conch. p. 115.—Brown, Illust. Conch. G. B. p. 71, pl, 24, f. 1.—Alder, Catal. Moll. Northumb. and Durh. p. 76.—Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 142.—Philippi, Moll. Sicil. vol. i. p. 82, and vol. ii. p. 57.—Sowerby, Thesaur. Conch. vol. i. p. 53, pl. 17, f. 141 to 146.—Hanl. Recent Shells, vol. i. p. 272, pl. 10, f. 43.—Chenu, Illust. Conch. Pecten, pl. 29.—Cuvier, Règne Anim. (ed. Croch.) pl. 75, f. 3.

*Ostrea sanguinea*, Poli, Test. Sicil. vol. ii. pl. 28, f. 7, 8.

" *lineata*, Pulteney, Hutchins, Hist. Dorset, p. 36.—Donov. Brit. Shells, vol. iv. pl. 116.—Maton and Rack. Linn. Trans. vol. viii. p. 99; Rack. Dorset Catalog. p. 38, pl. 10, f. 8.—Dillw. Recent Shells, vol. i. p. 267.—Index Testaceolog. pl. 10, f. 44.

*Pecten sanguineus*, Costa, Test. Sicil. p. 50.

*Pecten subrufus*, TURT. Dithyra Brit. p. 210, pl. 17, f. 1. — Brit. Marine Conch. p. 116. — SOWERBY, Thesaur. Conch. vol. i. p. 53, pl. 19, f. 208, 209, 210.
„ *Audouinii*, PAYRAUDEAU, Cat. Moll. Corse, p. 77, pl. 2, f. 8, 9.—HANL. Recent Shells, vol. i. p. 273.
*Peigne operculaire*, CHENU, Traité Element. p. 101, f. 339.
*Pecten plebeius* and *Pecten sulcatus* (fossil), SOWERBY, Min. Conch. pl. 393.

Both valves of this orbicular shell are convex, but the lower one is decidedly the more so. They are tolerably strong, and similar in sculpture to each other, being everywhere rough with minute scales or squamular crenæ, which are most crowdedly arranged on very numerous and closely disposed elevated radiating striulæ. From eighteen to twenty-three ribs diverge from the umbo of each valve; these are but moderately elevated, and in the more typical examples rounded, and of about the same width as their interstices. In the variety *Audouinii*, the scales are especially developed, and those which, crowning the summit of each rib, are seated on stria so coarse as almost to carinate it, are manifestly larger than the rest. The ribs of the immature specimens are abrupt, and narrower in proportion than in the adult: their interstices are simply sculptured with very delicate concentric lamellæ. The auricles are of very nearly equal dimensions, and rather small than otherwise; they are subrectangular above, the under ones inclining slightly to the obtuse, the front one of the upper valve to the acute: occasionally they are costellated and echinated, but chiefly on the under valve, more frequently they merely exhibit coarse and minutely squamular elevated striæ. The auricular sinus is small and shallow, delicately pectinated, or rather, minutely dentated (at times obscurely) below, with the terminal angulation single and acute. The hinge-margin is not level, but rises a little on either side of the beaks, particularly in the less convex valve, where it laps over, and is not unfrequently crowned with fine dentated scales; its entire length is scarcely equal to one half the distance from the beaks to the opposite ventral margin, which latter is strongly arcuated, the most projecting portion of the lateral curvatures of the shell being (in the adult) rather above than below the middle of the sides. The triangular callus on either side of the cartilage in the under valve is large and rather projecting. The colouring is very variable, it is frequently of an uniform white, yellow, orange, red, brown, or purplish pink; with the under valve of a lighter cast, and the interior whitish and more or less stained with the external painting. Often, too, it is clouded or variegated with two of these tints, as, for instance, with undulating streaks of white on a dark pinkish red ground. One of the most striking styles of painting is that exhibited in the variety *lineatus*, where the snowy surface of the valves is relieved in one or both of them by a dark red line crowning the summit of all the costæ. A beautifully painted shell in our cabinet is speckled with snow-white spots, edged below with chocolate-red on a ground of crimson, with three of its ribs stained with brilliant orange yellow. The diameter ascribed to the species by the accurate Montagu, is "about two inches and a half;" but this is rather above than below the ordinary standard. The length very slightly exceeds the breadth, except in the young, where the converse prevails. The variety *Audouinii* is by no means uncommon, and is usually mottled or variegated, and of a darker colour internally than in the typical form. We met with a young single valve of it at Torquay, which, from the magnitude of its upper costal squamæ, and the imperfect developement of its subsidiary and interstitial scales, presented the aspect of a distinct species.

"Professor Macgillivray," writes Mr. Jeffreys, "showed me, this last summer, a shell, which, he said, had been named after himself (*P. Macgillivrai*, Edmonston, Ann. Nat. Hist. vol. xv. p. 250); it was undoubtedly an *opercularis*, having its outer coat eroded either by disease or some acid."

The animal is shaped like the shell. The margins of the mantle are freely open; both the fixed and free edges of the pendant borders are fringed with filaments of unequal length, and appearing as if arranged in two or three irregular rows. These are usually white; among the series nearest the shell are ranged at regular distances more than thirty bright pearly blue globular ocelli. The mantle-margins themselves are most usually variegated with brown. The body is large, the upper portion cream colour, and the lower or pointed and free part of a bright pink or vermilion hue. The foot is small, conical, and furnished with a byssal groove, from which young specimens often spin a byssus and fix themselves to sea-weeds and corallines. The branchiæ are brownish or reddish.

This handsome shell is generally distributed around our coast, living in various depths, from five to one hundred fathoms, but abounding most in from fifteen to twenty-five fathoms. It is often found gregariously associated in banks of considerable extent, and is abundant on most natural oyster-beds. It is the *common scallop* of the people, and besides being prized in many places as a delicious article of food, whether fresh or pickled, its shells are turned to account in the making of ornamental work. It is generally distributed throughout the European seas, and is found fossil in the later tertiaries.

*Note.*—Our valued friend and correspondent, Dr. Knapp, has paid particular attention to the variations of the different British species of *Pecten*. He finds, in the Frith of Forth, six varieties of the *Pecten opercularis*, according as the prevailing colour is brown, purple, yellow, or white variegated with blotches or undulated markings of some colour different from the general hue; rarely does it occur of a pure white. *Pecten varius*, from the west coast, varies in like manner, and among its colours presents a pale-slate variety, with white markings. *Pecten sinuosus* presents similar changes, but has not been observed pale purple, and is rarely pure white. He distinguishes no fewer than eighteen colour-varieties of *Pecten obsoletus*, seven of which are white, four either pure or variously marked with purple, brown, and yellow; seven, purple, either plain or variously marked with white, yellow, and brown; three, orange, or orange and white; and one in which all the colours are equally mingled.

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## P. ISLANDICUS, Müller.

Free, not marbled, set with from fifty to a hundred small but distinct ribs, which are not prickly, but armed with erect and peculiarly crowded vaulted scales.

LISTER, Hist. Conch. pl. 1057, f. 4.—SEBA, Mus. vol. iii. pl. 87, f. 7.

*Pecten Islandicus*, MÜLLER, Zool. Danic. Prodr. (1776), p. 248, No. 2990.—TURT. Dithyra Brit. p. 216. — FLEMING, Brit. Animals, p. 385. — MACGILLIV. Moll. Aberd. p. 226. — Brit. Marine Conch. p. 119.—BROWN, Illust. Conch. G. B. p. 72, pl. 24, f. 3. — O. FABRIC. Fauna Groenland. p. 415. — CHEMN. Conch. Cab. vol. vii. pl. 65, f. 615, 616. — LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 145. — SAY, American Conch. pl. 56, f. 1. — SOWERBY, Thesaur. Conch. vol. i. p. 75, pl. 17, f. 159, 160, 165. — GOULD, Invert. Massach. p. 134, f. 87.—HANL. Recent Shells, vol. i. p. 284.

*Ostrea cinnabarina*, BORN, Index Mus. Cæs. (1778) p. 87; Mus. Cæs. Vind. p. 103.—DILLW. Recent Shells, vol. i. p. 256.

„ *Islandica*, GMELIN, Syst. Naturæ, p. 3326. — TURT. Conch. Diction. p. 258.—Index Testaceolog. pl. 10, f. 21.

*Pecten Pealii*, CONRAD, American Marine Conch. p. 12, pl. 2, f. 2.

Encyclopédie Méthodique, Vers, pl. 212, f. 1.

Notwithstanding that of the many supposed British individuals of this fine shell we have never seen a single individual which did not exhibit a fossilized appearance, we have preferred classing the *P. Islandicus* among our doubtful natives, rather than entirely excluding a species, the comparative nearness of whose ascertained localities fairly argues the possibility of its being at some time (if not already) discovered as a living inhabitant of our own waters. The following brief description has chiefly been drawn up from Newfoundland specimens.

Suborbicular or broadly obovate, subequivalve tolerably strong or solid, not transparent, not polished, valves moderately convex, the upper one passing from light orange or livid flesh colour to reddish brown, often adorned with about three obscure paler rays, the colouring matter disposed in lighter and darker concentric zones; the lower valve almost white, and decidedly the more shallow. Entire external surface radiated with crowded (from fifty to one hundred) irregularly disposed unequal costellar striæ so grouped as to form numerous indistinct and unequal folds, which appear better defined when viewed from the interior. These linear ridges, which exist likewise upon the auricles, where, however, they become coarser, and occasionally less approximate, are roughened, but not aculeated, by an infinite number of minute and peculiarly close-set erect and vaulted scales. Hinge-margin more than equal to half the length of the shell. Auricles well defined: the front one very large, its upper corner nearly rectangular, its costellæ few and large upon the lower valve; hinder auricle moderate in size, only half as long as the front one, but of similar depth; its angle not very obtuse. Angle of the auricular sinus, which is moderately profound, single, and acute. Internal surface white, polished, often a little pearly, sometimes with a subumbonal stain of dull red in the more convex valve; margin jagged by the external costellæ.

Our largest specimen, which measures four inches in breadth, is not above a third of an inch inferior in its length; the young shells are much less orbicular, an example an inch long exceeding this measurement in breadth by two-fifths of an inch.

Although both Müller and Born are prior in point of date to Fabricius, the merit of first describing this shell adequately belongs assuredly to the latter; indeed the diagnoses in the "Prodromus" are far too brief to enable us to distinguish the species mentioned from their allied exotic congeners, however sufficient for the discrimination of them from those which inhabit the same shores.

*Pecten islandicus* is an abundant fossil in the pleistocene beds of the Clyde, and may be found in numbers at low water in the Kyles of Bute, as observed by Mr. Smith of Jordanhill. It has been dredged always as dead valves and as if fossil in various depths of water, as off Skye in forty fathoms, near Mull in ninety fathoms, and off Zetland in one hundred fathoms (M'Andrew). Also in thirty-five fathoms off Aberdeen (Thomas) where, Professor Macgillivray states, dead valves are common. It is a living inhabitant of the Norwegian, Greenland, and Boreal American Seas.

### SPURIOUS.

### P. Jacobæus, Linnæus.

*Ostrea Jacobæa*, Linn. (not Turt. Conch. Diction.) Syst. Nat. ed. 12, p. 1144; Mus. Ulric. p. 522.—Pulteney, Hutchins, Hist. Dorset, p. 36.—Donovan, Brit. Shells, vol. iv. pl. 137.—Maton and Rack. Linn. Trans. vol. viii. p. 97.—Rack. Dorset Catalog. p 37, pl. 13, f. 2.—Born, Mus. Cæs. Vind. p. 98.—Poli, Test. Sicil. vol. ii. p. 149, pl. 27.—Dillw. Recent Shells, vol. i. p. 248.

*Pecten Jacobæus*, Penn. (not Fleming), Brit. Zool. ed. 4, vol. iv. p. 100, pl. 60, f. 62.—Da Costa, Brit. Conch. p. 143.—Mont. Test. Brit. p. 144.—Turt. Dithyra Brit. p. 207.—Brown, Illust. Conch. G. B. p. 71, pl. 24, f. 5.—Lam. Anim. s. Vert. (ed. Desh.) vol. vi. p. 130.—Philippi, Moll. Sicil. vol. i. p. 78, and vol. ii. p. 56.—Sowerby, Thesaur. Conch. vol. i. p. 46, pl. 15, f. 107, 108, and pl. 17, f. 153.—Hanley, Recent Shells, vol. i. p. 269.—Cuvier, Règne Anim. (ed. Croch.) pl. 75, f. 2.

" *Jacobi*, Chemn. Conch. Cab. vol. vii. p. 273, pl. 60, f. 588.

Encyclop. Méthodique, Vers. pl. 209, f. 2.

*A Mediterranean shell; introduced by Pennant as "a rare shell in Great Britain," and said by Pulteney to have been found on the Dorset coast. As no specimens have been obtained of late, although never was the dredge so actively employed as during the last few years, it is to be presumed that this shell was included as British from that spirit of easy credulity which tempted our older writers to admit as indigenous so many exotic shells into their works, on the careless authority of their friends' mixed collections, and imperfect memories.*

### OSTREA. Linnæus.

Shell variously shaped, inequivalve, more or less inequilateral, often thick and irregular, upper valve most frequently flat or concave, under one convex, surface foliated, or with radiating furrows; hinge without teeth; ligament lodged in a pit in each valve, the beak behind that of the under valve often produced and exhibiting a furrowed ligamental area. Muscular scar subcentral, pallial impression obscure, entire.

Animal shaped like the shell, its mantle freely open and without tubes, the edges double, and each bordered by short tentacular fringes; no conspicuous ocelli; branchial leaflets not doubled on themselves; labial appendages triangular, connected around the mouth by a plain membrane; foot obsolete.

The sexes of oysters, according to recent observations of Quatrefages, are distinct. Our most valued bivalve belongs to this genus, and is the only species of it now inhabiting our seas. During ancient epochs, as we learn from the fossils of both tertiary and secondary strata, many more kinds of oyster lived within our area, and multiplied so as to rival the contents of any modern oyster-beds. The discoveries of geologists open scenes of regret to the enthusiastic oyster-eater, who can hardly gaze upon the abundantly entombed remains of the apparently well-fed and elegantly shaped oysters of our Eocene formation, without chasing "a pearly tear away" whilst he calls to mind how all those delicate beings came into the world and vanished, to so little purpose.

### O. EDULIS, Linnæus.

Plate LIV. and (animal) plate T. fig. 1.

LISTER, Anim. Angl. pl. 4, f. 26; Hist. Conch. pl. 193, 194.

*Ostrea edulis*, Linn. Syst. Nat. ed. 12, p. 1148; Fauna Suecica, p. 520.—PENN. Brit. Zool. ed. 4, vol. iv. p. 102.—PULTENEY, Hutchins, Hist. Dorset, p. 36.—MONT. Test. Brit. p. 151.—MATON and RACK. Trans. Linn. Soc. p. 101.—Dorset Catalog. p. 38, pl. 11, f. 6.—TURT. Conch. Diction. p. 133; Dithyra Brit. p. 204.—FLEMING, Brit. Animals, p. 392.—Brit. Marine Conch. p. 120.—BROWN, Illust. Conch. G. B. p. 71, pl. 23, f. 19, and pl. 30, f. 6, 7.—BORN, Mus. Cæs. Vind. p. 113.—DILLW. Recent Shells, vol. 1, p. 280.—Index Testaceolog. pl. 10, f. 74.—LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 217.—BLAINVILLE, Manuel Malacolog. pl. 60, f. 1.—CROUCH, Introd. Lam. Conch. pl. 12, f. 8.—SOWERBY, Genera Shells, Ostrea, f. 1.—BROWN, Conch. Text-book (ed. 1), p. 111.—REEVE, Conch. Systemat. pl. 120, f. 1.

*Ostreum vulgare*, DA COSTA, Brit. Conch. p. 154, pl. 11, f. 6.

*Ostrea hippopus*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 219.

„ *deformis*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 229.

„ *parasitica*, TURT. (not Gmelin) Conch. Diction. p. 134, f. 81; Dithyra Brit. p. 204, pl. 17, f. 6, 7.—FLEMING, Brit. Animals, p. 393.—Brit. Marine Conch. p. 120, f. 108.—BROWN, Illust. Conch. G. B. p. 71.

There is as much dissimilarity of aspect between the sleek-looking valves of the flattened "Native Oyster" of our markets, and the more coarse and rugged (but far more beautifully sculptured and coloured) solitary individuals which are ordinarily termed "Rock Oysters," as there exists in the acknowledged flavour of their several inhabitants. The former is too well known to require any particular description, the latter is a much more characteristic looking shell and not very frequently observable, in fine preservation, in the cabinets of our collectors. Whilst those individuals most ordinarily met with at our tables have the surface of the upper valve of an uniform drab or brownish buff-colour, this variety is beautifully radiated, in addition, with lines and streaks of dull purplish crimson or reddish chocolate colour, and its concentric lamellæ, which are extremely thin, and usually composed of rather large plates, instead of being appressed, are more or less elevated, broadly overlap each other, and are rather obscurely folded in radiating fashion. The ribs, or rather radiating folds, of the lower valve, which are more or less numerous, and for the most part narrow or but moderately broad, are sometimes stained with rich purplish red towards the margin, and, when the concentric laminæ are elevated (which is generally the case when the valve is attached by the apex alone), are wont to be surmounted by vaulted, and even occasionally somewhat tubular fimbriations. When this form is affixed by the entire surface of the lower valve, (which consequently loses all traces of colouring or sculpture), the laminæ of the upper valve are quite devoid of folds, and the lower series of them overlaps, as it were, the ventral edge of the inferior valve. In ordinary circumstances, these laminæ, when perfect, extend as far as the extreme edge of the attached valve, but the somewhat pearly substance of the interior, which is white (in one variety with purple stains), is never so far produced as the nacre of the other valve.

The natural form of our undisturbed oyster, which is apt to vary greatly in that respect, but is, we believe, always broader than long, appears to be obovate, contracted above, and dilated below; we have seen it, however, of almost as produced a shape as that of Virginia. The upper valve is always the flatter (or, at least, the more shallow), the lower the more solid. The edges of the shell, although irregularly wavy, are never plicated, and are neither crenated nor scabrous, but the vicinity of the cartilage is often beset in one or both valves with closely-disposed raised denticular wrinkles (not granules) or even elevated rugose sulci, which run parallel to the hinge-line. These denticles vary very greatly in number and distinctness, sometimes becoming nearly if not quite obsolete.

About four inches may be considered the average breadth for the full-sized common rough oysters of our markets, but they are occasionally found at least five inches wide.

The animal of our oyster is much compressed, yet rather thick, and of a general drab colour, with darker viscera, and brownish margins to its mantle. The latter, except on the beaks, is freely open, with slightly pendent margins, double fringed, the filaments short and rather irregular; the anal orifice is sessile. The great adductor muscle is very powerful, white and round ; it is esteemed one of the sweetest morsels of the oyster's body. The liver is of a greenish hue, and the ventral mass of a creamy white.

The *Ostrea edulis* may be said to have its capital in Britain, for though found elsewhere on the coasts of Europe, both northwards and southwards, in no part of them does it attain such perfection as in our seas, through which it is generally distributed, sparingly in some places, abundantly and in gregarious assemblages in others, chiefly inhabiting the laminarian and coralline zones. The ancient Romans valued our native oysters even as we do now, and must have held them in higher estimation than those of Italian shores, or they would not have brought them from so far for their luxurious feasts. Juvenal records the exquisite taste of the epicure ;—

Who
At the first bite each oyster's birth-place knew ;
Whether a Lucrine or Circæan he 'd bitten,
Or one from Rutupinian deeps in Britain. *

In Bishop Sprat's "History of the Royal Society," is contained the first paper of importance on the oyster-fisheries of England. It is selected by the bishop as one of the examples which he gives of the various kinds of papers read before the Royal Society at that time, and respecting it he well remarks, "it may, perhaps, seem a subject too mean to be particularly alleged ; but to me it appears worthy to be produced. For though the British oysters have been famous in the world ever since this island was discovered, yet the skill how to order them aright has been so little considered amongst ourselves, that we see at this day, it is confined to some narrow creeks of one single county." The paper is so short, concise, and important in its bearing on the history of British oyster-fisheries, that we transcribe it nearly entire. It is entitled, "The History of the Generation and Ordering of Green Oysters, commonly called Colchester Oysters," and runs thus:—"In the month of May the oysters cast their spawn (which the dredgers call their spat) ; it is like to a drop of candle, and about the bigness of an halfpenny. The spat cleaves to stones, old oyster-shells, pieces of wood, and such

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* "Circæis nata forent, an
Lucrinum ad saxum, Rutupinove edita fundo
Ostrea, callebat primo deprendere morsu."
JUVENAL, *Sat.* iv. 140.

like things at the bottom of the sea, which they call cultch. It is probably conjectured that the spat in twenty-four hours begins to have a shell. In the month of May, the dredgers (by the law of the Admiralty Court) have liberty to catch all manner of oysters of what size soever. When they have taken them, with a knife they gently raise the small brood from the cultch, and then they throw the cultch in again, to preserve the ground for the future, unless they be so newly spat that they cannot be safely severed from the cultch; in that case they are permitted to take the stone or shell, &c. that the spat is upon, one shell having many times twenty spats. After the month of May it is felony to carry away the cultch and punishable to take any other oysters, unless it be those of size (that is to say) about the bigness of an half-crown piece, or when the two shells being shut, a fair shilling will rattle between them. The places where these oysters are chiefly catched are called the Pont-Burnham, Malden, and Colne-waters. * * * This brood, and other oysters, they carry to creeks of the sea at Brickel-sea, Mersey, Langro, Fringrego, Wivenho, Tolesbury, and Saltcoase, and there throw them into the channel, which they call their beds or layers where they grow and fatten, and in two or three years the smallest brood will be oysters of the size aforesaid. Those oysters which they would have green, they put into pits about three foot deep, in the salt-marshes, which are overflowed only at spring-tides to which they have sluices, and let out the sea-water until it is about a foot and half deep. These pits from some quality in the soil co-operating with the heat of the sun, will become green and communicate their colour to the oysters that are put into them in four or five days, though they commonly let them continue there six weeks or two months, in which time they will be of a dark green. * * * The oysters when the tide comes in lie with their hollow-shell downwards, and when it goes out they turn on the other side; they remove not from their places unless in cold weather to cover themselves in the oose. The reason of the scarcity of oysters, and, consequently, of their dearness, is because they are of late years bought up by the Dutch. There are great penalties by the Admiralty Court laid upon those that fish out of those grounds which the court appoints, or that destroy the cultch, or that take any oysters that are not of size, or that do not tread under their feet, or throw upon the shore, a fish which they call a five-finger, resembling a spur-rowel, because that fish gets into the oysters when they gape and sucks them out. * * * The oysters are sick after they have their spat; but in June and July they begin to mend, and in August are perfectly well. The male oyster is black-sick having a black substance in the fin; the female white-sick having a milky substance in the fin. They are salt in the pits, salter in the layers, saltest at sea."

From this old paper the greater part of the matter contained in articles on the subject of oyster-fisheries in the several Encyclopedias has been derived. In the earlier volumes of the "Philosophical Transactions," are several notices on the subject of oysters, especially a short account of the spat by the celebrated Leewenhoeck, and a letter from the Rev. Mr. Rowland to Dr. Derham, in which it is stated that though the beds in the Manai furnished then (1720) as they do now, abundant oysters, twenty-four years previously none existed in the locality; they were originally laid down there by a private gentleman. These beds are now recruited from the Irish coast.

In order to obtain the most recent information respecting the oyster-beds which supply the London market, the extent of the supply, and the opinions of those practically concerned in their management, and in the sale of their products, on points in the history and value of what may be termed *cultivated* oysters, we drew up a series of queries, to which, chiefly through the obliging interest taken in the inquiry by Mr. J. S. Sweeting, of 159, Cheapside, we have received from that gentleman,* and from other well-informed quarters, very full replies, the results of which we now give in a condensed form.

The oyster-beds from which the principal supply for the London market is procured, are those of Whitstable, Rochester, Milton, Colchester, Burnham, Faversham, and Queenborough, all artificial beds, furnishing *natives*. Since the introduction of steamboats and railroads, considerable quantities of sea-oysters are brought from Falmouth and Helford in Cornwall, from the coast of Wales, the Isle of Wight, and neighbourhood of Sussex, and even from Ireland and Scotland, after the winter sets in, as before they would not keep fresh enough when brought from long distances. The supply derived from natural beds varies much, since on some of them the oysters are not sufficiently abundant to pay for dredging. The sea-oyster is often before being brought to market kept for a time in artificial beds in order to improve its flavour.

The most esteemed oysters are those of the small, ovate, but deep-shelled variety, called *natives*, among which those of the river Crouch, or Burnham oysters, are pre-eminent for their marine flavour; probably on account of the facilities for rapid importation of them in fine condition. Much of the quality depends on the ground and condition of the beds; and oysters of different years from the same place often vary materially in this respect. They are considered full-grown for the market when from five to seven years old: sea-oysters at four years. The age is shown by the annual layers of growth or "shoots" on the convex valve. Up to three or four years, each annual growth is easily observed, but after their maturity it is not so easy to count the layers. Aged oysters become very thick in the shell. In the neighbourhood of fresh water the oyster grows fast, and improves in body and flavour. The flavour is said by some to improve by shifting the oysters as they approach their full growth. Frost kills numbers, and when they are left dry at low ebbs, the run of fresh water from the land turns them what is called "foxy," of a brownish red colour. They are sometimes seized with sickness during the spawning season and considerable numbers may die. Much labour is required to keep the beds in good order, cleansed from shells and rubbish, star-fishes, barnacles, corallines, and sea-weed, which grow freely in the spring of the year. On the cleanliness of the ground, the prolific character of the bed, if the oysters breed there, depends. If carefully attended to, a bed may last any length of time, but if neglected it will become overgrown with weed and buried in mud, so that it can only be reclaimed by restocking at a great expense, or is altogether destroyed. Artificial beds for the purpose of keeping a supply at hand for the London market are said to have been commenced about the year 1700 by the Kent and Essex Companies of Dredgers. The oyster does not breed freely, often not at all, on artificial beds, so that they require to be constantly restocked; and when they do spawn under such circumstances, the fry are said seldom to come to perfection. On their natural grounds they spawn profusely during the season, *i. e.* during the summer months. The developing spawn is technically called "spat."

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* We have to return many thanks to Mr. James Wickenden of Rochester, and Mr. W. H. Williamson, senior, of the same town, for very full information.

The oyster has not a few enemies. Star-fishes, especially the *Uraster rubens* and *Solaster papposa*, are supposed to do great injury to the beds; the dredgers call them five-fingers. Whelks, called by the fishermen whelk-tingle, or sting-winkle, are also said to do much damage, perforate the shells with small holes, selecting especially those of from one to two years' growth. They are popularly supposed to strike directly for the heart of the oyster. That most curious sponge, the *Cliona*, perforates the shell in all directions, and directs its operations, with a wonderful symmetry as we now know through the curious investigations of Mr. Albany Hancock. Milne-Edwards states that in some places on the coast of France the oyster-beds run a risk of being destroyed through the tube-constructing powers of certain Annelides (*hermellæ*), becoming buried under masses of their curious habitations framed of agglutinated particles of sand.

In London, the chief consumption of common oysters is from the 4th of August to January, and of natives from October to March. The consumption is said to be greatest during the hottest months after the commencement of the oyster-season; the warmer the weather, the more oysters are consumed. They are brought to market in craft of various sizes; they are packed in bulk closely in the hold; in some cases a cask of salt water is kept from which to sprinkle them superficially. Those that come by rail are packed with their convex shells downwards in bags and barrels. From the boats they are transferred to the salesmen, who keep them in a little salt and spring water, and shift them every twelve hours. Some pretend to improve them by "feeding" them with oatmeal. Oysters, like other bivalves, live chiefly on infusoriæ. The quantity consumed annually in London varies in different seasons. One informant states twenty thousand bushels of natives, one hundred thousand bushels of common oysters to be about the mark; another estimates the quantity sold in the season from the 4th of August to the 12th of May to be nearly one hundred thousand London bushels, each bushel being three Manchester or imperial bushels; and that about thirty thousand bushels of natives are sold during the same period by various companies. During the season commencing on August the 4th, 1848, and ending May 12th, 1849, Mr. Wickenden estimates about one hundred and thirty thousand bushels of oysters to have been sold in London, though of that quantity about one-fourth was sent away to various parts of the United Kingdom and the Continent.

The oyster-fisheries are protected by legislative enactments. Various acts of parliament have [*] been passed for the better preservation of the oyster-beds and prevention of trespass upon them. To steal oysters is a larceny; to dredge on an oyster-bed unlawfully or wilfully, is being guilty of a misdemeanour, punishable by fine or imprisonment—fine not to exceed 20*l.*, or imprisonment three calendar months. It is as well that ardent conchologists should know these (to them) obnoxious enactments, for otherwise they may find the search for a new or rare species at the wrong season of the year cost more trouble and expense than it is worth. It is not only artificial oyster-beds which are claimed as private property, but many of those in the open sea, on various parts of our coast.

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[*] 31 George III. c. 51.—48 George III. c. 144.—7 and 8 George IV. c. 29.

Oysters of good repute are fished in the neighbourhood of the Channel Islands. There are two oyster-banks, the one off Guernsey, and the other off Jersey. The former is of little importance; the latter of considerable value. They belong to the region of oyster-banks which extends along the coasts of Normandy and Brittany. Dr. Knapp informs us that the number procured annually from them for the use of the Channel Islands and English markets cannot be less than eight hundred thousand tubs, each tub containing two English bushels, and in some years thrice that quantity is believed to be procured from those banks during the season. As many as three hundred cutters have been employed upon them dredging. The oysters on the Jersey bank are of large size, and are sold at from five to seven shillings the tub, or from three to four pence the dozen. Milne-Edwards and Audouin state (in their "Histoire Naturelle du Littoral de la France") that during the year 1828 the total number dredged on the French banks of this region was about fifty-two million, the average price of which was three francs fifty cents for every "millier," *i.e.* twelve hundred. These French oyster-banks are stated by the authors quoted to yield a produce valued at from eight to nine hundred thousand francs a year. Before the French oyster-fisheries were put under restrictions the banks were deteriorating through continual fishing.

The oyster-fishery of most consequence in Scotland is that of the Frith of Forth, respecting which some valuable information has been communicated to us by Dr. Knapp.

The oyster-beds there extend about twenty miles, from the Island of Mucra to Cockenzie, and are dredged in from four to six or seven fathoms water. The best are procured near Burntisland, on a bed belonging to the Earl of Morton, on the rocky ground, opposite Portobello, and at Prestonpans. The price varies, wholesale, from two shillings to two shillings and sixpence the hundred, the retail price from two shillings and sixpence to four shillings and sixpence, or even five shillings. Eight or ten years ago the price was much less, but an individual having taken the ground off Newhaven for a high rent, which he is said never to have paid, so cleared the beds that they have since been comparatively rare.

Mr. George Moffat, fishdealer in Edinburgh, has, at the request of Dr. Knapp, very kindly drawn up a note on the statistics of the oyster-fisheries of the Frith of Forth, and the consumption of oysters in the Edinburgh market, which, on account of its completeness, we print entire in a note.*

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* *Note on the oyster-fisheries which supply the Edinburgh market, by Mr. George D. Moffat.*

| | |
|---|---|
| Twenty-five boats, working for four months, viz., September, October, March, and April, say sixty-four days (four days per week), dredge at an average 480 oysters per boat per day. *Inde,* $25 \times 64 \times 480 =$ . . . . . . | 768,000 |
| Eight boats, working for four months, viz., November, December, January, and February, say sixty-four days (four days per week), dredge at an average 480 oysters per day per boat. *Inde,* $8 \times 64 \times 480 =$ . . . . . . | 245,760 |
| Number of oysters dredged at an average in the season at Newhaven, | 1,013,760 |

⁂ Fisherrow, Prestonpans, and Cockenzie, may be taken *in all* at the same *ratio.* Therefore, doubling the above, makes 2,027,520 oysters, which may be calculated to be dredged in the Forth in the season; only three-fourth parts of which, however, it is believed are sent to Edinburgh, being 1,520,640.

Natural oyster-beds of small extent occur at some distance from land in several places around the Isle of Man. The principal is that off Laxey; but though the oysters are fine and well-flavoured, their abundance is not sufficient to induce a regular fishery.

On both sides of Ireland oysters abound in many places, and some of the banks are valuable, producing oysters in abundance, and of good quality. In the west, the most famous are Burton Bindon's oysters, which are highly esteemed in Dublin. They are the Burran oysters, brought from the Burran bank in Galway bay, where they are laid down artificially, after having been originally dredged chiefly near Achil Head. There are oyster-beds in the Shannon, said, in 1836, to yield a revenue of 1400*l.* annually, and to employ seventy men and sixteen boats. Some small oyster-beds in Clare are private property, and yield various incomes, as do those also in Cork harbour, but none of them are of any extent. Oysters are dredged from natural beds on the coast of

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*Again,*

From the foregoing average the quantity dredged per day may be stated as follows:—

| | Boats. | Oysters. | |
|---|---|---|---|
| Principal season, four months, | 25 × | 480 = . . | 12,000 |
| Secondary season, four months, | 8 × | 480 = . . . | 3,840 |
| Per day for Newhaven, | | | 15,840 |

The same number for Fisherrow, Prestonpans, and Cockenzie, makes 31,680, threefourth-parts of which, as before mentioned, come to Edinburgh, being 23,760.

With regard to the consumption in Edinburgh, it will be apparent, that out of the season of eight months, only one hundred and twenty-eight days are stated, these being the men's working-days. But the days of the consumption of these Mollusks in town are (excluding Sundays), out of the eight months, two hundred and seven days. *Inde*, as before,

1,520,640 ÷ 207 = 7346 oysters, being the average daily consumed in Edinburgh during the season, from the beginning of September till the end of April.

Wexford, and elsewhere, in order to be laid down on the Beaumaris beds. The most renowned of the Irish oyster-fisheries is that of Carlingford. The shell-fish are there dredged by boats each manned by from three to five men, who take about fifty dozen a day. The oysters of each boat are deposited within a ring of large stones till sold; the place being marked by a buoy. They are sold to dealers only, at from 8*d.* to 2*s.* for ten dozen. A yearly fee of 5*s.* is paid by each boat to the Marquis of Anglesey. The fishermen earn from 4*d.* to 1*s.* 6*d.* per diem, and are mostly landholders.*

There are natural oyster-beds in Belfast bay, on banks at a depth of from twelve to twenty-five fathoms. Mr. W. Thompson informs us that in March 1848 he had the four largest oysters selected from about five hundred taken on these beds, and by weighing them before their being opened found two to be each one pound and a half, the third one pound and three-quarters, and the fourth two pounds, imperial weight. "The two largest oysters," he states, "on being taken from their shells weighed each an ounce and a half, and the others somewhat less. The oysters from which these were selected were sold at the rate of sixteen shillings for the one hundred and twenty-four. The shells were in length from five inches and a half to six and a half; in breadth from five inches to five and a half, and in depth with the valves closed two inches and a half." There are oyster-beds partly private and increased by planting in Loch Swilly. Irish oyster-dredgers have a notion that the more the banks are dredged, the more the oysters breed.

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* Report on Irish Fisheries for 1836.

## SPURIOUS.

### O. CRISTA-GALLI, Linnæus.

KNORR, Délices des Yeux, pt. 5, pl. 16, f. 1.

*Mytilus crista-galli*, LINN. Syst. Nat. ed. 12, p. 1155.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 104. — TURT. Conch. Diction. p. 109.—BORN, Mus. Cæs. Vind. p. 120.—DILLW. Recent Shells, vol. i. p. 300.

*Auris-porci*, CHEMN. Conch. Cab. vol. viii. p. 52, pl. 75, f. 684.

*Ostrea crista-galli*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 234.—SOWERBY, Genera Shells, Ostrea, f. 2.— Penny Cyclopædia, vol. xvii. p. 363.—REEVE, Conch. Systemat. pl. 121, f. 2.—CUVIER, Règne Anim. (ed. Croch.) pl. 72, f. 3.—CHENU, Leçons Elém. Hist. N. p. 108, f. 358.

*An Asiatic shell; introduced as taken alive on ships' bottoms. Montagu, who first indicated it as British by name, scarcely appears to have intended this species, since, in his description, he omits all mention of the characteristic granules of the exterior, and the scabrous edges of the interior.*

### O. FRONS, Linnæus.

ARGENVILLE, Conch. pl. 23, f. D.

*Mytilus frons*, LINN. Syst. Nat. ed. 12, p. 1155. — BORN, Mus. Cæs. Vind. p. 123, vignette, b. at p. 121. — BURROWS, Elements Conch. pl. 10, f. 4.—DILLW. Recent Shells, vol. i. p. 301.—Index Testaceolog. pl. 12, Mytilus, f. 3.

*Ostrea frons*, CHEMN. Conch. Cab. vol. viii. p. 61, pl. 75, f. 686.

,, *crista-galli*, MONT. (not Lam.) Test. Brit. p. 160?—TURT. Dithyra Brit. p. 202.

,, *rubella*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 231. — CUVIER, Règne Anim. (ed. Croch.) pl. 72, f. 2.

,, *limacella* and *crucella*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 231.

,, *folium*, SOWERBY, Genera Shells, Ostrea, f. 3.—REEVE, Conch. Systemat. pl. 121, f. 3.—SOWERBY, Conch. Manual, f. 181.

*A West Indian shell; introduced by Dr. Turton, as it had been taken alive on the bottom of a foreign vessel. The specimen in his cabinet is not the true* crista-galli *as he imagined, but a characteristic example of the long lost* frons *of Linnæus.*

### ANOMIA. Linnæus.

Shell oblong or suborbicular, usually more or less irregular, inequivalve, surface of upper and convex valve smooth, or lamellar, or ornamented by radiating and scaly striæ; under-valve flattened, deeply emarginated near the beak on one side by a large and ovate or round sinus, through which passes a strong adductor attached to an opercular shelly mass, by which the animal and its shell is fixed to various substances. Beaks very small; no teeth; valves united by a short and thick cardinal ligament; muscular impressions several.

Animal shaped like the shell, mantle freely open, with pendant margins bearing a double fringe of short cirrhi. No conspicuous ocelli. No siphonal tubes. Body massive. Foot very small, often nearly obsolete. Adductor muscle divided into three portions, the longest passing through the notch in the lower valve, and attached to the opercular piece, partly attached to the inner surfaces of the shell. Branchial leaflets doubled on themselves. Mouth surrounded by membranous borders, and two pair of long labial tentacles, striated on both sides. Sexes distinct.

Linnæus included in his genus *Anomia*, the species of *Terebratula*. Misled by a false analogy, he considered these very different mollusks to be organized on the same plan, and the perforations of one of the valves in each to be of similar origin. Lamarck, in like manner, fancied that in *Anomia* he saw a passage into *Terebratula* and the Brachiopods; and some anatomists even believed that they had discovered transitional characters. A close examination shows that there is no relationship of affinity between them, but only a resemblance through formal analogy.

The parts which seem, at first glance, in each to be identical, prove not to be homologous, upon investigation.

*Anomia* has really very close relations with *Pecten*, and is connected to the latter by the curious genus *Hemipecten* of Reeve. The perforation in one of the valves of *Anomia*, is chiefly a greater extension of the auricular sinus in *Pecten*; and when the very young fry of this genus shall have been carefully observed, we believe they will be found spinning a byssus which, passing through this sinus, fixes the shell in the first instance, before a portion of it becoming attached, eventually becomes detached with a part of the adductor muscle, and forms the opercular process. The animal is deleterious, and has a peppery taste.

The species of this genus are distributed through the seas of all regions, and fossil forms range far back in time, but never appear to have been very abundant. There is great difficulty in the determination of both recent and fossil forms. Opinion as to the true sources of specific character among the *Anomiæ* has fluctuated greatly; some conchologists would limit the number of admitted forms to a very few; others would swell the specific list by numbers of too evident varieties.

In the following account of the British *Anomiæ*, we have adopted the views at present held by many of the most distinguished malacologists of this country and of the Continent. We do so, however, only provisionally, and regret that the subdivisions here adopted are not borne out by an examination into the characters of the several animals. To this subject Mr. Clark has this year addressed his particular attention: the results of his researches go strongly against the notion of the specific permanency of characters in our native *Anomiæ*, and we feel bound to give the following extract from his communication relative to the features of their shells, whilst under *Anomia ephippium* we present his observations on the animal, all resulting in inducing that eminent observer to hold to the specific unity of all our British forms :—

"With regard to the young, or dwarf *A. ephippium*, the *A. squamula*, *A. aculeata*, and *A. striolata*, often crowded in groups of fifteen or twenty individuals on a single *Pecten opercularis*, I have not a doubt of their being mere varieties of *A. ephippium ;* all these, *often* adopt the markings of the substances on which they are fixed, and *as often* show an entire disregard thereto, though they all more or less invariably maintain the only true distinctive character of the type, the decided squamose appearance, which is never lost, whatever other markings there may be. I have seen shells combining all the supposed distinctive marks of each species or variety centred in one individual, in which the decided smooth glossy *A. squamula* commenced the umbonal part of the structure, gradually, for the middle region, gliding into the squamous *A. ephippium*, and dividing the basal portion, right and left, the one, into the spinous asperities of *A. aculeata*, the other, into the delicate smooth lines or striulæ of *A. striolata.* Nothing is more common than to see shells half *squamula* and half *ephippium*, half *A. aculeata* and half *A. striolata*, and other admixtures of the characters of two or three supposed species, on the same shell. These facts prove, that the various markings, ribs, striæ, &c., do not always, as it were, by reflexion take the markings of the substances on which they are fixed. All the last four dwarf varieties of *A. ephippium*, are also found at the roots of *Algæ* and *Fuci*, but they, like their brethren on shells, present, in the same individual, similar discrepancies of colour, and admixture of characters.

"The *A. cylindrica* or *A. cymbiformis*, is *A. ephippium*, taking the hollowed out boat-like appearance, in consequence of clasping the cylindrical stalks of the *Fuci*. The *A. tubularis* is the same type, having the margins of the apertures elongated to suit its condition to some irregularity of the body on which it is fixed. The *A. punctata* is of the same character, viz. *A. ephippium*, deriving its papillæ-like markings from the substances on which it is placed. I do not know *A. fornicata* and *A. coronata*.

"I have now noticed all the British varieties I am acquainted with, and there is certainly no sculpture on them of so decided a character as to pronounce specific distinction; therefore all the markings, shapes, colours, of this Protean genus of varieties being inadequate for the foundation of species, we must have recourse to our sheet-anchor, the malacology of the animal, to assist our determinations, and after the examination of a great number of individuals, embracing nearly all the British species, we can arrive at no other conclusion than a firm conviction that they are all varieties."

### A. EPHIPPIUM, Linnæus.

Destitute of natural sculpture; no triangular cavity on the under valve beneath the hinge.

Plate LV. fig. 2, 3, 5, 7, and (Animal) Plate T. fig. 2.

*Anomia ephippium*, LINN. Syst. Nat. ed. 12, p. 1150.—PENN. Brit. Zool. ed. 4, vol. iv. p. 109, pl. 62.—DONOV. Brit. Shells, vol. i. pl. 26, middle fig. — MONT. Test. Brit. p. 155. — MATON and RACK. Trans. Linn. Soc. vol. viii. p. 102; Dorset Catalog. p. 38, pl. 11, f. 3.—TURT. Conch. Diction. p. 2.—Dithyra Brit. 227, pl. 18, f. 1, 2, 3, and pl. 17, f. 10. — FLEMING, Brit. Animals, p. 395.—MACGILLIV. Moll. Aberdeenshire, p. 230. — Brit. Marine Conch. p. 121. — BROWN, Illust. Conch. G. B. p. 69, pl. 22, f. 1, 4. — BORN, Mus. Cæs. Vind. p. 117. — RETZIUS, Nov. Gen. p. 10. — CHEMN, Conch. Cab. vol. viii. p. 81, pl. 76, f. 692, 693. — POLI, Test. Siciliæ, vol. ii. p. 186, pl. 30, f. 9, 10.—DILLW. Recent Shells, vol. i. p. 287.—Index Testaceolog. pl. 11, f. 3. — LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 273. — BOWDICH, Elements Conch. pt. 2, Bivalves, f. 90.—MAWE, Linn. Conchology, pl. 15, f. 6.—SOWERBY, Genera Shells, Anomia. — SOW. (jun.) Concholog. Manual, f. 186. — PHILIPPI, Moll. Siciliæ, vol. i. p. 92, and vol. ii. p. 65.— REEVE, Concholog. Systemat. pl. 124.

*Anomia electrica*, LINN. Syst. Nat. ed. 12, p. 1150. —TURT. Conch. Diction. p. 1, f. 67; Dithyra Brit. p. 226, pl. 17, f. 8, 9. — FLEMING, Brit. Anim. p. 394.—Brit. Marine Conch. p. 120.—BROWN, Illust. Conch. G. B. p. 70, pl. 46, f. 5. — DILLW. Recent Shells, vol. i. p. 287.—Index Testaceolog. pl. 11, f. 5.—LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 274.

„ *squamula*, LINN. Syst. Nat. ed. 12, p. 1150; Fauna Suecica, p. 521.— PENN. Brit. Zool. ed. 4, vol. iv. p. 109.—DA COSTA, Brit. Conch. p. 167.—PULTENEY, Hutchins, Hist. Dorset, p. 36. — MONT. Test. Brit. p. 156. — MATON and RACK. Trans. Linn. Soc. vol. viii. p. 102.—Dorset Catalog. p. 39, pl. 13, f. 4. — TURT. Conch. Diction. p. 3; Dithyra Brit. p. 229, pl. 18, f. 5, 6, 7. — FLEMING, Brit. Animals, p. 395. — MACGILLIV. Moll. Aberd. p. 231.—Brit. Marine Conch. p. 122. — BROWN, Illust. Conch. G. B. p. 69, pl. 22, f. 5. — CHEMN. Conch. Cab. vol. viii. p. 86, pl. 76, f. 696. — POLI, Test. Siciliæ, vol. ii. p. 186, pl. 30, f. 18. — LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 275.

„ *cepa*, LINN. Syst. Nat. ed. 12, p. 1151. — PULTENEY, Hutchins, Hist. Dorset, p. 37.—DONOV. Brit. Shells, vol. i. pl. 26, side fig.— TURT. Conch. Diction. p. 3; Dithyra Brit. p. 228, pl. 18, f. 4. — FLEMING, Brit. Animals, p. 395. — Brit. Marine Conch. p. 121. — BROWN, Illust. Conch. G. B. p. 70, pl. 39, f. 12*. — CHEMN. Conch. Cab. vol. viii. p. 85, pl. 76, f. 695. — POLI (as *caepa*), Test. Sicil. vol. ii. p. 182, pl. 30, f. 1, 2, 5 to 8. — DILLW. Recent Shells, vol. i. p. 287.—LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 274.

„ *tunica cepæ*, DA COSTA, Brit. Conch. p. 166, pl. 11, f. 3.

„ *punctata*, CHEMN. Conch. Cab. vol. viii. p. 88, pl. 77, f. 698. — TURT. Dithyra Brit. p. 231, pl. 18, f. 11.—FLEMING, Brit. Animals, p. 395. — MACGILLIV. Moll. Aberd. p. 232. — Brit. Marine Conch. p. 122. — BROWN, Illust. Conch. G. B. p. 70, pl. 39, f. 13*. — GMELIN, Syst. Nat. p. 3346. — DILLW. Recent Shells, vol. i. p. 288.—Index Testaceolog. pl. 11, f. 6.

„ *flexuosa*, GMELIN, Syst. Nat. p. 3349 (from Schröt. Einleit. Conch. vol. iii. p. 418, pl. 9, f. 11).—Index Test. pl. 12, Anomia, f. 31.

„ *rugosa*, GMELIN, Syst. Nat. p. 3349 (from Schröt. Einleit. Conch. vol. iii. p. 419, pl. 9, f. 12).

*Anomia cylindrica*, Gmelin, Syst. Nat. p. 3349, from Schröt. Einleit. Conch. vol. iii. p. 419, pl. 9, f. 13. — Turt. Conch. Diction. p. 6; Dithyra Brit. p. 232.—Fleming, Brit. Anim. p. 395.—Macgilliv. Moll. Aberd. p. 232.—Brit. Marine Conch. p. 123. — Brown, Illust. Conch. G. B. p. 70, pl. 22, f. 7, 8. — Dillw. Recent Shells, vol. i. p. 291.—Index Testaceolog. pl. 11, f. 13.

„ *margaritacea*, Poli, Test. Siciliæ, vol. ii. pl. 30, f. 11.—Philippi, Moll. Sicil. vol. ii. p. 65.

„ *cymbiformis*, Maton and Rack. Trans. Linn. Soc. vol. viii. p. 104, pl. 3, f. 6.—Mont. Test. Brit. Suppl. p. 64.

„ *patellaris*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 273 (fide Deshayes).

„ *pyriformis*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 275. — Potiez, Galerie Douai, vol. ii. p. 41, pl. 43, f. 10.

„ *fornicata*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 275 (probably).—Turt. Dithyra Brit. p. 234, pl. 18, f. 12, 13. — Fleming, Brit. Anim. p. 396.—Brit. Marine Conch. p. 123.—Brown, Illust. Conch. G. B. p. 70, pl. 39, f. 14*, 15*.

„ *tubularis*, Turt. Dithyra Brit. p. 234. — Fleming, Brit. Anim. p. 396. —Brit. Marine Conch. p. 124.—Brown, Illust. Conch. G. B. p. 70.

„ *coronata*, Bean, Mag. Nat. Hist. vol. viii. p. 564, f. 52.

„ *polymorpha*, Philippi, Moll. Sicil. vol. ii. p. 65.

„ *scabrella*, Philippi, Moll. Sicil. vol. ii. p. 65, pl. 18, f. 1.

Professor Macgillivray has justly remarked, in his work on the Molluscous Animals of Aberdeenshire, &c., that the "property which the *Anomiæ* have of assuming and retaining the impression of the foreign bodies to which they adhere, ought to render us very circumspect in defining species." Acting under this impression, we have, in accordance with the opinion of the majority of those British naturalists who enjoy the most ample opportunities for examining and comparing the *Anomiæ* in every stage of growth, in every circumstance of habitat, and from the most widely extended range of localities, united into one species, after close personal study of the valves and careful scrutiny of the synonymy, the various shells (both British and foreign) above enumerated. Of the varieties, some few are solely dependent upon colour for discrimination, others, and by far the greater portion, are the result of accidental distortion, or the mere modifications of form, or that suppositious sculpture which all members of a sessile genus are liable to.

In the most freely-developed specimens—and these are less frequently met with in the adult than in the immature state—(the chances of the growth having been uninterrupted materially diminishing with age), the shape is suborbicular, though rather longer than broad, and the sides are nearly equal. The texture is pearly, and in the mass of examples is thin, white, a little transparent, and destitute of any natural sculpture whatsoever. In the large coarse specimens, however, to which the name *ephippium* is usually restricted by collectors, the texture is moderately thick, and at times almost opaque; the shape is more produced, the sides decidedly unequal, and the surface, from the shell being ordinarily attached to oysters, correspondingly, though in a diminished ratio, sublamellar, or concentrically girt with undulating wrinkles. Such as are found on *Pectens* imitate their radiating ribs; yet it is not generally difficult to determine, even when an *Anomia* is detached, whether the apparent costæ are natural to the species, or of extraneous origin, by observing whether all the ribs emanate from the umbo, whence they invariably radiate in all essentially ribbed species of this genus. The beaks are acute and terminal, but bend either to the right or left: occasionally, also, they are subcentral and inflected. The upper valve is usually the more ventricose and solid; the lower, the thinner and more flattened; occasionally, however, the latter—which, except at the beaks, is almost of equal dimensions to the former—becomes, from the necessities of its position, wholly or partially convex. The perforation—which in the more characteristic examples is subovate, and almost always is broader than long, and generally, too, is more or less oblique—is sometimes simple at its edge, sometimes surrounded with a kind of reflected margin, which is at times appressed, at times elevated (as in the variety *tubularis* where the contracted aperture forms a very short tubular projection). This aperture, which is occasionally, though rarely, suborbicular, varies also in its relative proportion to the size of the valves; the average extent of its outline, as compared to that of the entire shell, is about as one to three; the severed ends of the aperture lie sometimes far apart from each other, sometimes become almost approximate. In general, brilliancy of nacre is accompanied by thinness of texture and largeness of aperture. The solid and laterally projecting strip of shelly matter, which separates the perforation from the edge of the upper valve is very narrow.

When the young is uninterruptedly developed, and found on smooth substances, such as the interior of dead bivalves, &c., it is flat, suborbicular, and quite smooth, with its beak projecting beyond the margin, and its perforation small in proportion to the dimensions of the valve; but when exposed on rough substances, it assumes quite as distorted an appearance as the adult shell, to which it approaches in almost every character. In the former case it is the *squamula* of authors; the name *cylindrica* or *cymbiformis* has been attached to such as embrace the stalks of *Lamellaria* or other cylindraceous bodies. The monstrosity *fornicata* exhibits, to use the words of Turton, a large vaulted chamber under the hinge of the larger valve; *punctata* has its upper valve embossed with tubercular prominences, and its lower with corresponding indentations arising from elevations present on the rock coral or other marine object on which the shell may be seated: the edge of *coronata*, in adapting itself to the substance on which it has been affixed, has become serrated on one side. The nacre of the varieties *cepa* and *electrica* are tinged, the former with lilac or rose colour, the latter with yellow or rich amber colour; in both the perforation is peculiarly large and the lower valve remarkably thin.

Our larger examples are about two inches long and rather less in breadth.

The individuals received from North America, as the *ephippium* of Gould (Invert, Massach. p. 138), have their lower valve both within and without of a decided bluish green, with generally an opaque white internal circumference to the perforation: their upper valve displays a yellow umbo on a ground otherwise devoid of colouring. Possibly the examination of a sufficient number of examples might elicit such other features, as to warrant the separation of the Transatlantic shell.

The following account of the animal of *Anomia ephippium* is from the pen of Mr. Clark:—

" Animal suborbicular, mantle circular, the upper portion, lining the convex valve, of very thin and pellucid texture, except at the margin, which is thick and fleshy; the under valve, or that lying on the flat valve, is also thin, but has the appearance of being very fleshy from having the lower portion of the ovarium soldered to it; both margins are clothed with a double fringe, and they diminish in breadth as they approach the beaks, the upper one passing round the aperture of the operculum and there throwing out cilia, and with the under valve fix themselves under the beaks. The margins on the outer circle have long white or yellowish, thick set, very pointed tentacular filaments, which may be seen protruded beyond the shell, and on the inner circle, there are long and short cilia of the same colour, but distributed irregularly; the general colours of the marginal area of the fringes are a mixed blotchy red, yellow or purplish brown. No ocelli can be detected.

" There are a pair of circular branchiæ, varying from pale-red to dark-brown, on each side the body which is very small, with very fine longitudinal and transverse vessels; the plates of each pair have part of their outer surfaces doubled on them, thus forming circular open pouches.

" The oval margined mouth, with its large aperture, is placed very high up in the dorsal ranges, and has around it two plain linear membranes, which are continuations of the branchiæ, which at this point have become attenuated; these laminæ expand at each side the mouth, into two pair of long very delicate labia, fixed by the entire length of the longest sides, folding on each other, and have the finest striæ on both surfaces: the colour varies from light to dark brown.

" The foot is almost reduced to nothing, it is fixed to the body under the mouth, and is a small yellow obtuse, subcylindrical, deeply grooved pendulous body.

" The ovarium is an extensive inflated sinuated lobe, originating on each side the liver, coasting around the body, part thereof being glued to the lower portion of the mantle; this organ has been mistaken for a large foot, but its soft milky composition of separate granules, show that it is the organ of reproduction, and the milky humour mixed amongst the granules, which appear to spring from pyriform membranes, is probably the fecundating fluid.

" The ovarium varies greatly in colour, from deep vermilion to quite white.

"The liver is always of the shades of green, and situated at the centre of the dorsal range; the passage from the mouth to the stomach, which is under, and partly enveloped by it, is very short; from it the anal tube descends to the centre of the body, where it makes a short turn, and ascends by the body, through the ovarium to the dorsal range, and again descends, slightly attached to the membrane of the latter organ, and debouches at some distance from the base of the posterior ventral range.

"Finally, as regards the animal, it is necessary to observe, that in this singular and unsymmetrical genus, even its organs, like its shell, display varieties of form; from the entire animal being deposited in the convex valve, it only rests on the flat one, consequently, the organs vary, in some measure, with the figure, form, and depth of the concavity of the upper valve."

This Protean species is distributed throughout the European Seas, and on our own coast it is common everywhere. It occasionally occurs free with the perforation soldered up, as we have dredged it in the Bristol Channel. It ranges from low-water-mark to as deep as twenty or thirty fathoms (M'Andrew). Mr. Jeffreys has taken the variety *cylindrica* in one hundred fathoms off the Zetlands.

### A. ACULEATA, Müller.

Small; surface radiated with regular raised striæ, which are usually armed with prickles: no triangular cavity on the under valve beneath the hinge.

Plate LV. fig. 4.

*Anomia aculeata*, MÜLLER, Zool. Dan. Prodrom. p. 249.—MONT. Test. Brit. p. 157, pl. 4, f. 5.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 103.—TURT. Conch. Diction. p. 4; Dithyra Brit. p.

233.—Fleming, Brit. Anim. p. 396. — Macgilliv. Moll. Aberd. p. 232.—Brit. Marine Conch. p. 123, f. 73.—Brown, Illust. Conch. G. B. p. 70, pl. 22, f. 6. — Brugière, Encycl. Méthod. Vers, vol. i. p. 73. — Dillw. Recent Shells, vol. i. p. 288. — Philippi, Moll. Sicil. vol. ii. p. 214, pl. 28, f. 1 (probably). — Gould, Invert. Massach. p. 139, f. 90. — Lovèn, Index Moll. Scandinav. p. 30.

*Anomia striolata*, (var.) Turt. Dithyra Brit. p. 233. — Flem. Brit. Animals, p. 396. — Macgilliv. Moll. Aberd. p. 233 ? — Brit. Marine Conch. p. 125.—Brown, Illust. Conch. G. B. p. 70.

The *Prickly Anomia* is a very small species closely resembling a young *ephippium*, from which it may be distinguished by its spinous sculpture. This is composed of extremely crowded vaulted scales, disposed in a more or less close order, which radiate in all directions from the umbo, and are occasionally seated on interrupted elevated striæ or narrow costellæ. When circumstances permit its developement, the attached valve is wont to exhibit a similar echinated appearance; ordinarily, however, it is devoid of sculpture and very thin and fragile. The undisturbed shell is more or less suborbicular, the colour is whitish or pale ochraceous brown, and never adorned with coloured markings or a green interior. The umbo is almost marginal, and the perforation is ovate, of moderate size, and immediately adjacent to the hinge-margin.

We consider the *striolata* of Turton to be a variety of this species, with more distant and less echinated striæ. From three-eighths to half an inch may be reckoned the full diameter.

Distributed everywhere around our coast in similar localities with *ephippium*, though probably not ranging so deep. It is found throughout the North Atlantic very small, of an uniform whitish or brownish hue with radiating vaulted scales; the perforation is immediately adjacent to the dorsal edge.

### A. PATELLIFORMIS, Linnæus.

Surface radiated with regularly disposed wavy ribs; a triangular cavity on the under valve beneath the hinge.

Plate LVI. fig. 5, 6.

*Anomia Patelliformis*, LINN. (not Chemn.) Syst. Nat. ed. 12, p. 1151; Nov. Act. Upsal. 1773, vol. i. p. 42, pl. 5, f. 6, 7.—RETZIUS, Nova Genera Test. p. 11. — LOVÈN, Moll. Scandinav. p. 30.

*Ostreum striatum*, DA COSTA, Brit. Conch. p. 162, pl. 11, f. 4.

*Anomia undulatim striata, &c.*, CHEMN. Conch. Cab. vol. viii. p. 88, pl. 77, f. 699.

„ *undulata*, GMELIN, Syst. Nat. p. 3346. — MONT. Test. Brit. p. 157, pl. 4, f. 6. — MATON and RACK. Trans. Linn. Soc. vol. viii. p. 103. — RACK. Dorset Catalog. p. 39, pl. 11, f. 4. — TURT. Conch. Diction. p. 4; Dithyra Brit. p. 230, pl. 18, f. 8, 9, 10. — FLEMING, Brit. Anim. p. 395. — MACGILLIV. Moll. Aberd. p. 231. — Brit. Marine Conch. p. 122. — BROWN, Illust. Conch. G. B. p. 69, pl. 22, f. 2, 3. — BRUGIÈRE, Encycl. Méth. vol. i. p. 74, pl. 171, f. 16, 17, and pl. 184, f. 5, 6.—DILLW. Recent Shells, vol. i. p. 289.—Index Testaceolog. pl. 11, f. 9. — BROWN, Conch. Text-book, ed. 1, p. 110.

*Ostrea striata*, PULTENEY, Hutchins, Hist. Dorset, p. 36. — DONOV. Brit. Shells, vol. ii. pl. 45.—MONT. Test. Brit. pp. 153, 580.

The characters by which this apparently distinct form may be discriminated from *ephippium*, are few in number, but easy of observation. About twenty or thirty slightly flexuous radiating ribs emanate from the umbonal region (they are seldom if ever visible upon the umbo itself) of the upper valve, and thence diverging all round, crenate the outer margin of the shell. These are but moderately elevated, convex (not square) above, and are for the most part rather narrower than their interstices, which, as well as themselves, are crowdedly traversed in a concentric direction by very delicate and somewhat laminar striæ. A rather narrow perpendicular dull-surfaced triangular area is excavated, in a somewhat shelving fashion, in that portion of shelly matter which surmounts the aperture of the lower valve.

The shape of the shell, although variable, is usually more or less suborbicular, and has a tendency rather to increase in width than length. In the younger and more beautiful individuals the exterior is adorned with a warm tinge of reddish brown upon the interstitial spaces of the costæ. The valves are generally more or less compressed, and the upper displays upon the central disk or area internally (and in the young externally likewise) a darker or lighter tint of bluish green. The beak is prominent, but is not (as in *ephippium*) immediately adjacent to the margin. The perforation, which is large in the most characteristic examples, seems rarely if ever oblique, is usually somewhat pear-shaped, and is divided from the edge of the outer valve by a comparatively broad space of shelly matter.

We have never seen examples which emulate the dimensions attained to by the preceding species; one of our largest, which appears from the solidity of the upper valve to be aged, measures only a full inch and a half in breadth and rather less in length.

This form has a greater range in depth than any of our other *Anomiæ* beginning in the Littoral and Laminarian regions, and living in some places, as off Cape Clear in the south and Cape Wrath in the north, as deep as forty-five and fifty fathoms. It is more abundant in the north and west than in the south, and on the whole is not so common as the preceding forms. It adheres closely to shells and stones, and ranges throughout the northern shores of Europe.

### A. STRIATA, Lovèn.

With most crowded rows of minute but not prickly scales: umbonal region of the upper valve green; a triangular depression as in *Patelliformis.*

Plate LV. fig. 1, 6, and Plate LIII. f. 6.

? *Squama magna*, CHEMNITZ, Conch. Cab. vol. viii. p. 87, pl. 77, f. 697 (from which *A. squama*, GMELIN and WOOD).
? *Anomia patelliformis*, WOOD (not Linn.) Index Testaceol. pl. 11, f. 10.
„ *striata*, LOVÈN, Index Moll. Scandinaviæ, p. 29.

Whether this elegant shell, which is undeniably the *striata* of Lovèn, be entitled to specific distinction, is perhaps a point which may be mooted hereafter. The present very limited acquaintance with *Anomia*, of which scarcely any distinct exotic forms have been described or even met with, at least in our English cabinets, forbids a positive determination of what are the essential specific characters of the shells of this genus, and renders it advisable to follow the opinion of a writer who has incontestably proved his profound powers of observation in his several dissertations upon the Testacea of Northern Europe.

The shape is more or less orbicular, and rarely exhibits much of that straightness in its dorsal outline that is so common in *ephippium:* its nearest relationship, indeed, is to *Patelliformis*, which it resembles in the dark-green hue of the subumbonal portion of its interior, in the dull triangular depression above the aperture of the inferior valve (which is so excessively thin, that it is wholly or partially broken in almost every individual we have examined,) in the occasional remoteness (for in most the beak is submarginal) of its umbo from the outer edge, the frequent radiation of its exterior by undulating and rather broad streaks of rufous brown, &c. The beautiful example we have delineated, is, however, of a pure white except upon the umbones, which are of a clear bluish green. The sculpture is very peculiar, the surface never exhibiting any of the characteristic ribs of the previous species. In place of them, it is covered with an infinity of most minute radiating series of small depressed or imbricated (yet somewhat vaulted) scales, which are disposed in such extremely close order as to leave no visible interstitial lines: the more abraded, or less fully developed examples, appear simply impressed with most crowded radiating striæ. These scales and striæ regularly emanate from the umbo, and are not moulded, as it were, by the adhesion of the valves to any similarly sculptured body.

Both Mr. M'Andrew and Mr. Jeffreys have taken this scarce Northern shell in the Hebrides: the latter gentleman at Loch Carron and Ullapool. Mr. Barlee has taken it at Oban. It inhabits the Scandinavian seas.

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*Note.*—In the Cornish Fauna of Jonathan Couch, we find an *An. inflata* (pt. 2, p. 39,) which is assuredly the fry of one of our larger species, and probably of *ephippium*. We have not seen the types, which are in the Museum of the Royal Institution of Cornwall; but give the description verbatim.

"This which I suppose to be undescribed is a minute species, the diameter of the disk being about the tenth of an inch. The form is circular, the valves smooth and regular; but it is especially characterized by the elevation of its centre, which is almost as high as the diameter of the valve. From this the beak is bent down, and small. The specimen described, which was attached to the shell of a *Pinna*, has the summit inflated and round; but a specimen which I found in Mount's Bay attached to sea-weed, was about equally elevated, but pointed. Further research will decide whether these specimens belong to the same species. In another specimen, found with the former in Mount's Bay, the beak approached but did not join the margin; and the upper valve was characterized by a number of well-marked circular raised ribs."

# ACEPHALA PALLIOBRANCHIATA, OR BRACHIOPODA.

The researches of geologists, and the discoveries of scientific travellers, prove incontestably that in time and space there are points or regions where peculiar groups of organisms attain a maximum developement in variety of character, or number of species, or multiplicity of individuals, constituting, as it were, a metropolis of the family or genus. Before and after, in geological time, and all around in geographical space, the number of members of the generic type diminishes. The great section of Mollusca, whose few living British representatives we have now to describe, is a memorable example of this phenomenon. The Brachiopods, though scantily distributed through existing seas, abounded in those of the long past, and rivalled the Lamellibranchiate bivalves in numbers and variety, whilst the latter were poorly represented by a very few species, members of a very few genera. Inferior in many features of their organization to the *Lamellibranchiata*, in the main they must rank as a great parallel group, equal in ordinal value, and aberrant in some respects from the Molluscan type.

They are styled *Palliobranchiata*, because their respiratory system, instead of being disposed in separate gills, is combined with mantle, on which the vascular ramifications are distributed; and *Brachiopoda*, because their apparent organs of motion are two large, variously curved, tubular cirrhated arms. They do not, however, effect any change of place by these organs, which cannot be said to be feet, but are extended processes springing from the margins of the mouth, and therefore analogous to the labial palps of other bivalves. These curious organs are in some Brachiopods quite free; in others, attached to a complicated cartilaginous or calcareous skeleton. None of the existing mollusks of this order are capable of changing place. Exclusive of their brachial apparatus, their bodies are but small. The digestive organs and nervous system are simple; there is no foot; the sexes are distinct; the organs of sex are attached to the mantle. The lobes of the mantle line, and usually adhere to the valves of the shell, which are not to be regarded as exactly homologous with those of other bivalves, but each as the equivalent of two half valves of a Lamellibranchiate Mollusk. The surface of the mantle is covered with vibratile ciliæ. The muscular system is variously developed in different genera. Ocelli and otolitic vesicles are certainly present in some species, if not in all. The history of their developement is unknown. Their food is infusorial.

The most striking feature of the animals of this great section—their possession of spiral fringed arms—was first noticed by Pallas in a *Terebratula*, and by Otho Frederic Müller in a *Crania*. The researches of Cuvier into the external structure and anatomy of *Lingula* recalled attention to the group, and that famous naturalist clearly perceived its importance. Not, however, until the great comparative anatomist of England, Professor Owen, aided by the invaluable collections of Hugh Cuming, who will ever rank among the foremost of benefactors to Malacological science, undertook a minute inquiry into the organization of several of the Brachiopodan types, could our knowledge of them be said to be sufficient for a clear perception of their true relations with other acephalous mollusks. The memoir, in which Mr. Owen published the details of his observations, is one of the chief ornaments of the first volume of the Transactions of the Zoological Society of London.

Professor Owen concludes that in all essential points the Brachiopoda closely correspond with the Acephalous Mollusca, and considers them "as being intermediate to the Lamellibrachiate and Tunicate orders, not, however, possessing, so far as they are at present known, distinctive characters of sufficient importance to justify their being regarded as a distinct class of mollusks, but forming a separate group of equal value with the Lamellibranchiata."*

Brachiopods are so rare or so local in the British seas, that ordinary collectors are not likely to meet with any. Not very long ago a British Brachiopod was one of the brighest gems in any collection so fortunate as to contain it. Three or four minute and undeveloped examples of *Terebratula caput serpentis*, and a few *Craniæ*, were all we were likely to meet with after exploring the great majority of public or private cabinets. Of late years great numbers of that interesting *Terebratula* have been taken, and the *Crania* has also been found in quantity, so that there is no longer difficulty in obtaining an indigenous type of the order.

A visit to any cabinet of fossil remains will, however, show that though now so scarce in this region of the globe, they were once present in myriads. To have any correct notion of the varied modifications of form and structure presented by Palliobranchiate Mollusks, it is absolutely necessary to examine fossil as well as recent forms, nor can the comparatively few of the latter now surviving in existing seas, convey any just idea of their systematic relations, so many of the connecting links between them being lost to life. A visit to the quarries at Dudley, or an Irish limekiln, or an oolitic section on the Dorsetshire coast, or a green sand ravine in the Isle of Wight, will furnish more sectional types, and afford more information about the Brachiopods, than an examination of the finest collection of the living species. In each of the above excursions a different set of forms would be collected, for the Brachiopods of the older palæozoic epoch differed materially from those of the newer, whilst differences as great are seen between those of the older and new secondary epochs. Many of the palæozoic genera have altogether disappeared when we rise among the secondary rocks, and in the latter we find forms which closely remind us of existing species, but which, though very near, are yet unquestionably distinct. In formations of all epochs a few generic types are common, and the *Lingulæ* of the earliest sedimentary formations, presenting traces of organic life, strikingly remind us of the species of that curious group living in exotic seas at the present day.

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* Zool. Trans. vol. i. p. 159.

## TEREBRATULIDÆ.

The genus *Terebratula* of Brugière—the original *Anomia*, although the latter name has been appropriated, as we have seen, by a very different assemblage of shell-fish—included within itself those shells which present a general similarity of form, due to the inequality of their valves and the perforation on or under the beak of the upper and larger valve for the passage of a muscular peduncle by means of which the animal is fixed to rocks, or shells, or other extraneous bodies. Most writers on existing shells use the term *Terebratula* in the Brugierian sense, but palæontologists have become more and more impressed with the necessity of breaking up this really vast assemblage of species, not merely on account of their number, which would be but a sorry reason for generic dismemberments, but because included in it we find lesser groups exhibiting important characters of structure, evidently of high value, whether we consider the features of the shell or the arrangements of the soft parts within it. As these subdivisions of the old genus *Terebratula* appear to have a value fully equal to the generic separations which we have admitted among the *Lamellibranchiata*, we feel bound to adopt them, however much our doing so may seem an innovation on conchological practice.

Baron Von Buch, one of the most philosophical of living palæontologists and geologists, was the first clearly to see the necessity for a revision of the *Terebratulæ*, and all that has been done of late years on the subject, must be regarded as fruit sprung from seed sown by him. In our country his footsteps have been followed with varied success by Phillips, Morris, M'Coy, and King. Their researches have been mainly directed to the elucidation of the fossil species. Very lately M. Alcide d'Orbigny has directed his sagacious mind to this important inquiry, and has brought, with a bold hand, the work of his predecessors and of himself, powerfully to bear upon both recent and fossil forms. According to his view of the generic sections into which they should be divided, each of our few British *Terebratulæ* would become a member of a different genus, and even fall under distinct tribes. We prefer regarding them as members of a single tribe, and as forming part of three very distinct and easily recognised genera.

### HYPOTHYRIS, Phillips.

Shell tumid, thin, inequivalve, equilateral, its surface marked with radiating striæ or grooves, and never punctated. Beak of upper valve entire, the perforation beneath it triangular and open, reaching the margin. No cardinal area. Apophyses consisting of two separate, curved, moderately developed blades projecting from the hinge of the lower or imperforate valve.

Animal with spirally coiled buccal appendages or arms, not fixed by a cartilaginous or testaceous skeleton.

Only two existing forms of *Terebratulæ* with non-punctated shells are known, the one about to be described, and the *Terebratula nigricans* of G. B. Sowerby, the habitat of which is unknown. In the fossil state, however, great numbers of shells nearly allied to *Hypothyris* are found. The propriety of separating this group from other *Terebratulæ* cannot be called in question, for structure of beak and foramen, peculiarity of the apophysary appendages, arrangement of the brachial organs of the animal, and microscopic structure of the shell all combine to define a natural and extensive genus.

The account given by Dr. Carpenter of the microscopic structure of the shell of our British *Hypothyris* is so important in its bearings that we transcribe it in his own words:—"This shell," he writes, "is remarkable for its divisibility into thin micaceous plates, which may be split into laminæ of extreme tenuity. I do not know any one of the Lamellibranchiate bivalves whose shell corresponds with it in this respect, except *Placuna* and *Anomia*, which evidently verge towards the *Brachiopoda*. This facility of lamination characterises a large number of the fossil species of the group; especially those which correspond with the one under consideration, in its peculiar characters. The natural laminæ thus obtained frequently afford better subjects for microscopical examination than can be procured by making sections in the ordinary manner. When these laminæ are examined with a good microscope they are found to present a most remarkable and characteristic appearance; they are traversed by a very regular series of lines, usually nearly straight, but sometimes slightly curved, and running quite parallel to each other. When the broken extremities of these natural laminæ are examined, it is seen that the lines in question are produced by sharp foldings of the shelly layer, which foldings are parallel to each other; and this view is confirmed by examination of the decalcified membrane of which only one continuous stratum exists in each lamina. When the natural internal surface of the shell is examined, a very beautiful appearance is presented by it; a most regular imbricated arrangement is seen, exactly resembling a tiled roof, in which the lower margins of the tiles are rounded, instead of being quadrangular. If a portion of the surface be slightly rubbed down, so that the connection of their tile-like markings with the interior structure can be traced, it is seen that they are the extremities of the longitudinal folds just mentioned, each row of them belonging to one lamina, and a series of the laminæ cropping out, one beneath another."

### H. PSITTACEA, Chemnitz.

Surface blackish, not punctulate, with radiating striæ.

Plate LVII. fig. 1, 2, 3.

DAVILA, Catal. Cabinet, vol. i. pl. 20, f. b. B.

*Anomia rostrum-psittaci*, CHEMN. Conch. Cab. vol. viii. p. 106, pl. 78, f. 713.

„ *psittacea*, GMELIN, Syst. Naturæ, p. 3348.—TURT. Conch. Diction. p. 5, f. 42, 43, 44.—DILLW. Recent Shells, vol. i. p. 296.—Index Testaceolog. pl. 11, f. 27.—MAWE, Linn. Conch. pl. 15, f. 3.

*Terebratula psittacea*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 333.—TURT. Dithyra Brit. p. 236.—FLEMING, Brit. Animals, p. 368. —THOMPSON, Ann. Nat. Hist. vol. xiii. p. 433.—Brit. Marine Conch. p. 127.—BROWN, Illust. Conch. G. B. p. 68, pl. 46, f. 2, 3, 4.—ALDER, Cat. Moll. Northumberl. and Durh. p. 74.—CROUCH, Introd. Lam. Conch. pl. 13, f. 4.—SOWERBY, Genera Shells, Terebratula, f. 5; Thesaur. Conch. vol. i. p. 342, pl. 71, f. 78, 79, 80.—SOWERBY (Junior), Conch. Manual, f. 202.—GOULD, Invert. Massach. p. 142, f. 91.—REEVE, Conch. Systemat. pl. 126, f. 5.

*Hypothyris psittacea*, KING, Ann. Nat. Hist. vol. xviii. p. 238.

THIS quaint and sombre-looking species, one of the very scarcest of our native shells, is of a somewhat globosely triangular shape, being acuminated above, and rather abruptly dilated below: it is very thin, gibbous, not polished, yet sometimes a little glossy or even slightly nacreous, and of a black or sooty hue; the surface, except at the extremities, is radiated with simple and rather closely disposed striæ (which become stronger as they recede from the umbones), besides being marked with more or less distinct and numerous concentric lines of increase. The valves are unequal; the upper or larger one, which above is compressed at the sides, is likewise somewhat flattened below, on account of an expanded but very shallow mesial hollow, which excepting at its termination is but little prominent; the lesser or lower one is the more swollen, and is neither indented nor ridged. The acuminated beak, which is perforated by a narrow triangular orifice (which is not entire), leans very considerably over the nestling and tumid umbo of the lesser valve. The upper edges of the larger valve are much produced, and decline so profoundly as to run at acute angles to each other. The marginal outline (which is not crenated) is peculiarly sinuous, the edge of the perforated valve indenting that of the entire one on both sides near the umbones, and likewise along the course of the mesial hollow. The internal cardinal appendage consists of two recurved not very long blades, that project, one on either side, from beneath the umbones.

The animal of this remarkable Brachiopod has been examined by Professor Owen. He states that from the two small processes, constituting the skeleton in this species, and continued from the sides of the hinge of the imperforate valve, "two spiral arms arise, fringed on their outer margins, but quite free excepting at their origins. When contracted they are disposed in six or seven spiral gyrations, decreasing towards their extremities; and, when completely unfolded, they extend beyond the shell twice its longitudinal diameter. The mechanism by which the arms are extended is single and beautiful: the stems are hollow from one end to the other, and are filled with fluid, which, being acted upon by the spirally disposed muscles composing the *parietes* of the canal, is forcibly injected towards the extremity of the arm, which is thus unfolded and protruded outwards. The alimentary canal commences by a small puckered transverse mouth, which is situated, as before mentioned, immediately behind the folded extremities of the arms, and opens opposite the middle line of the perforated valve. The œsophagus, after having passed through the membrane inclosing the viscera, makes a slight turn on itself and advances straight towards the opposite valve; it then suddenly expands into a large oval stomach, from the sides of which the canals branching out into the hepatic follicles are continued. The intestine returns in a direction towards the perforated valve, inclines to the right side, and makes a slight bend forward before perforating the circumscribing membrane, in order to terminate between the mantle lobes on that side. The whole alimentary canal thus forms a loop, whose convexity is turned towards the imperforate or upper valve." *

The interesting paper of Mr. King, in the eighteenth volume of the Annals of Natural History, has dispelled the doubts which had long been entertained respecting the indigenousness of this species. In it is recorded the fact of a *psittacea* having been brought up from the depth of thirty fathoms at a distance of twenty-five miles from the northern coast of Northumberland, dead, but hanging on the beard of our common large *Modiola*. Mr. Maclaurin has likewise procured it from the Berwickshire coast attached to the lines of the Caldingham fishermen (Berwickshire Nat. Club. vol. i. p. 213). In an interleaved copy of Laskey's "Catalogue of North British Testacea," which we possess, and which formerly belonged to Laskey himself, is this MSS. entry, "Terebratula Psittacea: the under valve was found by me on the shore at Aberlady Bay at low water, and since, a perfect specimen (has been taken) by dredging in the deeps, Frith of Forth, 20th July, 1825." The reputed South of England and Dublin Bay specimens are more questionable; indeed, there is every reason to suppose that they were exotic. Mr. R. A. C. Austen informs us that specimens have been sold in the south of Devon as British by fishermen employed in the Newfoundland fishery, and who, on inquiry, proved to have brought them from the banks of Newfoundland.

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* Owen in Zool. Transactions, vol. i. p. 152.

This shell lives more plentifully in the seas of Boreal America, Greenland, and Norway, and is found fossil, though rarely in pleistocene beds on both sides of the Atlantic.

## TEREBRATULA. Brugière.

Shell inequivalve, equilateral, regular, tumid or depressed, smooth, grooved, ribbed, or marked with radiating striæ, always punctated. Upper valve with its beak perforated; perforation entire, and separated from the hinge by a deltidium or area more or less developed, or incomplete and bounded by nearly obsolete deltidia. Hinge of two lateral teeth entering the upper valve. Apophysary system composed of more or less complicated looped cartilaginous or calcareous processes, free except at their origin from each side of the beak of the imperforate and inferior valve.

Animal with strongly cirrhated, looped, or contorted arms fixed to the apophysary skeleton.

Among living Brachiopods the species of the genus *Terebratula*, restricted as we here define it, may at once be recognised by their punctated shells with perforated beaks and foramina, in most instances completed by a deltidium, whilst on opening living or well-preserved dead specimens, the skeleton will be seen presenting the form of an apparatus composed of shelly or horny loops. The majority of living species of the old genus *Terebratula*, and an immense number of fossil forms ranging even to the Palæozoic epoch, belong to the genus so defined.

M. Alcide d'Orbigny proposes a minuter subdivision of the group, going so far as to regard the genus, even as above restricted, in the light of forming part of two families. In one group he includes four genera, viz., *Terebratula*, distinguished by having no area and a round foramen, encroaching more upon the beak than on the deltidium, which is composed of two pieces; *Terebratella*, having an area, and a two-pieced deltidium, upon which the foramen encroaches; *Terebrirostra*, having a deltidium formed of a single piece, and a foramen encroaching upon it; and *Fissirostra*, having a similar deltidium, but which is not encroached upon by the foramen; the latter being confined to the beak, and placed on its outer portion. The only one of these genera which includes an existing British species is *Terebratula*, in which *T. cranium* has its place. Our other native form, the *caput serpentis*, is placed by M. d'Orbigny in his *Terebratulina*, forming part of his family *Magasidæ*, in which the shells have no deltidia; and he distinguishes the genus from *Magas* by its truncated beak and eared valves. The distinction is very probably a good one.

We extract from Dr. Carpenter's report on the microscopic structure of shells the following very important account of the peculiar organization of the shell in our native *Terebratula caput serpentis*, which illustrates the distinctive features of the shell of *Terebratula* as compared with that of *Hypothyris*.

"When a thin portion, which has been preserved with the animal in spirit, is ground down from the inner side, so as to leave the outer surface unchanged, it will be seen that each perforation in the shell is covered in by an oval membranous disc, whose texture appears very firm. When a thin section thus made is exposed to the action of dilute acid, so as to remove from it the calcareous matter, it will be seen that these discs are connected together by a layer of very pellucid membrane, in which no distinct structure can be made out; this membrane, differing as it does from the membranous basis of the interior layers of the shell, is probably to be regarded in the light of an epidermis. When a portion of the shell, not reduced in thickness, is completely decalcified by immersion in dilute acid, and the membranous residuum is then examined, a very remarkable structure presents itself, such as is found in no shells of the Lamellibranchiate Bivalves. Attached to the membranous films are a series of tubular appendages, corresponding in diameter to the perforations in the shell, and arranged at the same distances. The *free* extremities of these appendages are much larger than those by which they are attached to the membrane, and have distinct *cæcal* terminations, which appear by the straightness of their border to have been flattened against the discs that closed the orifices of the perforations in the shell. Indeed in some instances these discs have remained adherent to them, when the shell membranes were torn asunder; and are seen edgeways, as in fig. 3, *a*.* There can be no doubt, therefore, that these membranous *cæca* occupied, in the living animal, the perforations already described as penetrating the shell from one surface to the other. This will be still more evident on reference to fig. 39 of my former report; in which it will be seen how exactly the shape of the cæca corresponds with that of the perforations, when the latter are laid open lengthways by a section of the shell perpendicular to its surface. The *lower* margin of that figure corresponds with the *outer* surface of the shell, and the diameter of the perforations is seen to be there greatly increased. With regard to the office of these cæca, however, I am unable as yet to give any distinct explanation. Their contents are of a brown granular character, in which I have recognised distinct cells (fig. 4), such as are to be met with in the tubuli and follicles of ordinary glands; and their whole aspect satisfies me that they must be regarded as possessing a glandular character. I have not been able, however, to discover the nature or destination of their secretion. The internal orifices of the perforations obviously constitute the outlets of the cæca; but there does not appear to be any system of tubes or canals for collecting the matters poured out from them, each cæcum having its distinct and independent termination on the internal surface of the shell. Although the unusual degree of adhesion between the mantle and the shells of *Terebratulæ*, first noticed by Professor Owen, formerly led me to suspect that the mantle might send prolongations into the perforations of the shell, I have not been able to discover any vestige of such. On the contrary, it has appeared to me that the mantle, which is a nearly homogeneous membrane where not traversed by vessels, is simply applied to the internal orifices of the cœca, and continued over them; no trace of any connection with them being visible when it is detached from the shell. I may mention, however, that I have found the surface of the mantle in contact with the shell to be scattered over with minute cells, corresponding in size and aspect with those contained in the cœcal tubes. "The physiological purpose of this curious structure, therefore, is at present a mystery; but there can be little doubt that it is a very important one in the economy of the animal, when we see the shell thus rendered subservient to the special protection of these cœcal appendages."

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* See plate in the work cited.

### T. CAPUT-SERPENTIS, Linnæus.

Subovate; attenuated above; whitish, costellated.

Plate LVI. fig. 1, 2, 3, 4.

*Anomia caput-serpentis*, LINN. Syst. Nat. ed. 12 (not ed. 10), p. 1153; Fauna Suecica, ed. 2, p. 521; Acta Upsaliens. 1773, vol. i. p. 41, pl. 5, f. 3.—BORN, Mus. Cæs. Vind. p. 119.—CHEMN. Conch. Cab. vol. viii. p. 103, pl. 78, f. 712, and vol. xi. p. 248, pl. 204, f. 2013.—DILLW. Recent Shells, vol. i. p. 293.—Index Testaceolog. pl. 11, f. 22.

„ *retusa*, LINN. Syst. Nat. ed. 12, p. 1151; Fauna Suecica, ed. 2, p. 521.—DILLW. Recent Shells, vol. i. p. 292.

„ *pubescens*, LINN. Syst. Nat. ed. 12, p. 1153.—SCHRÖTER, Einleit. Conch. vol. iii. p. 397, pl. 9, f. 10.—DILLW. Recent Shells, vol. i. p. 293.—Index Testaceolog. pl. 11, f. 20.

„ (*nov. spec.*), PENNANT, Acta Upsaliens. 1773, p. 39, pl. 5, f. 4.

*Terebratula pubescens*, MÜLLER, Zool. Danic. Prodromus, p. 449, No. 3007.

„ *caput-serpentis*, LAM. (not Retzius), Anim. s. Vert. (ed. Desh.) vol. vii. p. 332.—SOWERBY, Genera of Shells, Terebrat. f. 2.—PHILIPPI, Moll. Sicil. vol. i. p. 95, pl. 6, f. 5, and vol. ii. p. 66.—REEVE, Conch. Systemat. pl. 126, f. 2.—SOWERBY, Thesaur. Conch. vol. i. pl. 68, f. 1 to 4, and pl. 72, f. 116.

„ *costata*, LOWE, Zoologic. Journal, vol. ii. p. 105, pl. 5, f. 8, 9.

„ *aurita*, FLEMING, Philosop. Zool. vol. ii. p. 498, pl. 4, f. 5; Brit.

Animals, p. 369.—Brit. Marine Conch. p. 127.—Brown, Illust. Conch. G. B. p. 68.

*Terebratulina caput-serpentis*, D'Orbigny, Pal. Franc. T. C. vol. iv. p. 58.

Davila, Catalog. Cabinet, vol. i. pl. 20, f. F.—Poli, Test. Sicil. vol. ii. pl. 30, f. 15 (part of group).—Encycl. Méthod. Vers, pl. 246, f. 7.

Although liable to no inconsiderable amount of variation in form, this shell is always more or less of a rounded pentagonal, and somewhat egg-shaped figure, its general outline ranging from narrow subovate to broadly obovate; the distance from the beaks to the base always exceeds (and very greatly so in the young) the space between the lateral extremities. Its valves, which are moderately and not very unequally ventricose, are slightly translucent, devoid of polish, not very thin, and of an uniform squalid white, but frequently appear stained with two buff-coloured spots, which, however, are only the result of the imperfect removal of the animal. The surface is everywhere covered with very numerous radiating dichotomous or forked costellæ, which are generally of the same breadth as their interstices, and are far coarser in the fry (and consequently upon the umbonal region of the adult) than towards the slightly emarginated base of the mature shell; which difference, the absence of basal retusion at that stage of growth, and the circumstance (not unusual at any period of increase) of being found invested with a supposititious epidermis of downy sponge, induced the early separation of the young under the epithet *pubescens*. The marginal line, which is delicately subcrenulated within, is flexuous at the sides, and the lateral edges of the smaller valve approach each other at the beak in an angle, that is usually an acute one in the young, a right or even a slightly obtuse one in the adult. The larger valve is somewhat rostrated; the perforation is moderate in size, somewhat oblique, and not entire. The cardinal area is rather flattened, and the deltidia are almost obsolete. The internal appendage, which is always attached to the lesser valve, is very small, not extending more than one third the distance to the ventral edge; it is arched and vaulted below. There is occasionally, in those individuals whose bases are the more emarginated, an obscure indication in one or both valves of a broad and shallow mesial groove. A fine individual measured eleven lines from the apex to the base, and three quarters of an inch from side to side.

The arms or buccal appendages of the animal occupy the greater part of the cavity of the shell. They are fixed to and follow the course of the apophysary skeleton, and appear, when the shell is forcibly opened, in the form of a pair of brilliant orange or crimson fringed loops lodged in each half of the cavity of the imperforate valve. The outer margins of each loop bear long cirrhi also of a brilliant orange or crimson hue, and though the arms themselves cannot be protruded, these cirrhi are very extensile; when the animal is lively, the two valves separate and gape for no very great distance from each other in front, and from their sides are seen the long crimson cirrhi extended like a pair of double fringes, and borne somewhat stiffly and with a slight curve outwards. Towards the edge of the strongly adherent mantle attached to each valve, are placed at regular intervals about forty small cirrhi of a softer texture, which do not appear to be protruded, at least conspicuously, beyond the edges of the shell. These cirrhi are tinged with crimson also. At their bases are seen, when a high magnifying power is used, coloured dots and cavities with vibrating corpuscles, which may be regarded as ocelli and otilitic capsules. The whole surface of the mantle is studded with vibratile cilia. On each side of the inner surface of the perforate valve is seen an ovarium of an oblong shape and brilliant vermilion colour, and extending beyond these ovaria in radiating fashion, are the yellowish glandular masses of the liver.

This interesting mollusk was first added to the British Fauna by Dr. Fleming, to whom, indeed, we are indebted as the first naturalist who noticed our indigenous Brachiopoda. He found it at Ullapool, in Loch Broom. It was afterwards found by the Rev. J. Berkeley at Oban. In each case a single specimen only was taken. Latterly it has been taken in many localities, in from ten to fifty fathoms, on the west coast of Scotland, especially by Mr. Jeffreys, Mr. M'Andrew, and Mr. Barlee. The following habitats will show its range in depth: Loch Fyne, in from fifty to thirty fathoms, plentiful; off Lismore, near Oban, in from twenty to thirty fathoms, plentiful; abundant in eighteen fathoms off Armadale, in the Sound of Skye. In twenty to ninety fathoms off Mull; in thirty fathoms off Raza. On the Lingbank, forty miles west of Zetland, in fifty fathoms; and in forty fathoms off Fitful Head (M'Andrew and E. F.). A single specimen from the north of Ireland is contained in the Ordnance Survey Collections (W. Thompson). Bantry Bay (Dr. Armstrong). It lives attached to stones and shells; sometimes, as Mr. Jeffreys observes, to sea-weeds.

This species ranges throughout the European seas, but south of Britain it appears to occur only at considerable depths. It extends its range to the Arctic seas, and is very nearly allied to the *T. septentrionalis* of the coasts of the United States.

As a fossil, it is found in tertiary strata, and if the cretaceous *T. striatula* be identical with it, is one of the most ancient of existing animals.

### T. cranium, Müller.

Surface smooth, whitish, minutely punctulate.

Plate LVII. fig. 11.

*Terebratula cranium*, Müller, Zool. Dan. Prodromus, p. 249, No. 3006.—Mont. Trans. Linn. Soc. vol. xi. p. 188, pl. 13, f. 2.—Turt. Dithyra Brit. p. 236.—Fleming, Brit. Animals, p. 368; Treatise Mollusc. Anim. pl. 14, f. 49.—Brit. arine Conch. p. 126.—Brown, Illust. Conch. G. B. p. 68, pl. 22, f. 10, 11, 12.—Lovèn, Moll. Scandinav. p. 29.

*Anomia cranium*, Gmelin, Syst. Nat. p. 3347.—Turt. Conch. Diction. p. 5.—Dillw. Recent Shells, vol. i. p. 294 (in part; not synonyms).

*Terebratula vitrea*, Fleming (not Born nor Chemn.), Edinb. Encycl. vol. vii. p. 96, pl. 206, f. 2; Philosophy of Zoology, pl. 4, f. 4.

The shape of the *Skull Terebratula* is ovate or obovate, being but moderately contracted (yet slightly acuminated) above, and but little arcuated below; the central portion of the ventral margin is occasionally a little straightened. The shell is rather gibbous, smooth, glossy, somewhat diaphanous, and of an uniform squalid white or yellowish horn-colour. The valves are almost equal in convexity, and devoid of either ridge or mesial groove: the larger or upper one is somewhat produced above, slightly recurved, and obliquely truncated at the tip, displaying a large perforation whose margin is not entire or united. The lower or smaller valve is a little flattened, and the slope of its dorsal edges is decided but not abrupt, and generally more or less convex. The suture or junctional line of the valves is a little, but not particularly sinuous, and quite entire. The cardinal area is indistinct and rounded; the deltidia are small, linear, and separate. The internal appendage, which is large, extending two-thirds the distance from the cardinal margin, is composed of two lateral loops, one on each side, which, folding back again, unite in a single very ample loop above.

The recorded size of one of the examples described by Montagu, was an inch and an eighth from the beak of the larger valve to the ventral margin, and seven-eighths of an inch when measured from side to side. These dimensions somewhat exceed those of an individual, full-grown to all appearance, that we received from the north of Europe, which only measured eleven lines and a half by nine and two-thirds.

The discovery of this species as a British production, is due to that veteran naturalist, Dr. Fleming, who forwarded an account of his obtaining a group of three individuals (we presume the one delineated in his Philosophy of Zoology) to Col. Montagu, who described the shell at large in the eleventh volume of the Linnæan Transactions. He had obtained it from a cod-line in deep water to the eastward of Bressay in Zetland. Our own drawing is copied from the figure in the last-named work, aided by a Swedish example, for as two out of the three original types have been lost (those given to Leach and Montagu) the liberal discoverer has not unwisely refused to trust the unique British example still left him, to the risks attendant upon its transit from Scotland.

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We entertain but little doubt that the *Anomia Terebratula* of Turton's Conchological Dictionary, all mention of which was omitted in his subsequent work on British Bivalves, was identical with this species, which the Doctor at that time, by his own confession, had never seen. His reference for a figure is to Da Costa's Elements of Conchology, pl. 6. fig. 3 (probably the nearest likeness to the shell intended he was acquainted with), which represents the *T. vitrea*, a closely allied species with an entire foramen, and a shorter cardinal appendage. From the statement in the Dictionary that the single specimen dredged alive in Dublin Bay had been deposited in the Museum of the Dublin Society, a search has more than once been instituted for it, the result of which shows that a *Terebratula* thus marked is certainly present (Thompson), but is the *psittacea*, a species that by no means harmonizes with the description of the shell in question, and which, moreover, was well known to, and adequately described by the Doctor. Either, then, the locality has possibly been appended to the wrong diagnosis (if, indeed, there be any connection between the ticketed example and Turton's observation), or not improbably the individual described, being, in truth, the exotic *vitrea*, having been detected as spuriously indigenous, was purposely left out in the later and more original "Dithyra Britannica."

## MEGATHYRIS. A. D'ORBIGNY.

Shell inequivalve, inequilateral, semi-orbicular, compressed, often strong, surface smooth, or with radiating ribs, always punctated. Area large, triangular, with a large incomplete foramen under the beak of the upper valve, and impinging on the lower; no deltidium. No free apophysary system, but one or more ribs or dissepiments rising from the inner surface of the smaller valve.

Animal with contorted or spiral arms fixed to the margin of the apophysary ribs and cardinal teeth.

The very rare and minute *Terebratula cistellula* of Mr. Searles Wood appears to belong to the genus *Megathyris* of D'Orbigny, of which *Terebratula detruncata*, and some other Mediterranean species, are better known examples. Several species are known fossil, ranging as far back as the Cretaceous epoch. They differ so materially from the *Terebratulæ* properly so called, that Dr. Philippi has been induced to consider them as members of the fossil genus *Orthis*, with which, however, they have no near affinity. M. Alcide d'Orbigny has associated *Megathyris* with *Thecidea*, forming of these genera his *Thecididæ*, the second family of his second order, *Abrachiopoda* of *Palliobranchiata*.* But, though fully prepared to admit the just claims of these brachiopods to generic distinction, we can scarcely, in the present state of our knowledge, regard them as farther removed from *Terebratula* proper than *Lingula*, *Productus*, or *Crania*, as M. d'Orbigny would place them; whilst he associates them in the same great group with the anomalous *Rudistæ*, which appear really to have much closer relations with *Crania*. Although Philippi describes *Terebratula detruncata* as having no arms, but only cirrhi attached to the apophyses, our own examination of that animal would rather go to maintain the existence of true but fixed arms; and in the curious *Orthis anomioides* of Scacchi and Philippi (which is the *Terebratula depressa* of the "Report on the Mollusca of the Ægean"), the latter eminent malacologist figures and describes two perfect spiral cirrhigerous arms, the species in question evidently having no very distant affinity with that which we are about to describe.

The few living species known of this interesting genus are inhabitants of deep—often very deep—water, where they are found adhering to stones and corals. It is most likely that, generally speaking, the Orthidiform brachiopods indicate a considerable depth of water, and that their presence abundantly in a sedimentary deposit should lead to such an inference respecting the circumstances under which the stratum was formed.

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* D'Orbigny, "Terrains Crétacés," vol. iv. p. 7.

### M. CISTELLULA, Searles Wood.

Minute, not ribbed; truncated at the umbones.

Plate LVII. fig 9. (magnified).

*Terebratula cistellula*, SEARLES WOOD, Annals Nat. Hist. vol. vi. p. 253 (fossil).
„ *seminulum?* JEFFREYS, Ann. Nat. Hist. vol. xix. p. 312.

The extreme minuteness, and the scarcity of specimens, of this the smallest of existing *Terebratulæ* has prevented us from giving so detailed an account of the species as we could have wished.

The shape, even in the few examples we possess, has a remarkably wide range of variation. That which we have figured, and which has a greater appearance of regularity than the majority of individuals, has its contour almost hemispherical, but the figure of certain examples is assuredly much more orbicular, but always more or less truncated above. The valves are rather depressed, and seem nearly equal to each other in convexity and extent; they are a little pellucid, tolerably strong for their size, are devoid of radiating striæ, having only some concentric lines of growth, and are wholly or partially covered with minute raised dots. Their colour is tawny-yellow or pale yellowish-brown; but this hue may possibly be caused by the presence of the dried animal. The hinge line is straight and much produced; the central retusion of the opposite margin is shallow but distinct. The mesial groove of the lower or ventral valve is well marked, and on either side of it the surface is a little tumid: the corresponding elevation in the upper or dorsal valve, if present at all, does not appear prominently developed. The umbones are scarcely raised above the hinge-line, and are habitually more or less abraded. The cardinal area is depressed and triangular; the foramen is extremely large; the chief portion of it is situated in the dorsal valve, the circuit being completed by the hinge-margin of the other, which is often a little concave (perhaps from friction) at that part. The inner edge is not crenated, but is somewhat radiatingly scabrous.

We have not been willing to destroy our examples by the examination of the internal appendages; judging from analogy it is probable that they closely resemble those of *detruncata*,* the species, which of those delineated in Sowerby's excellent monograph of *Terebratula*, most nearly approaches it in general characters. The shape seems nearer to the *decollata* of the same work. Individuals measuring the eighth of an inch from side to side may be accounted large; indeed few of those we have seen exceed a single line.

This rare and curious little Brachiopod was originally known only in the fossil state, having been discovered by Mr. Searles Wood in the Coralline Crag of Sutton. From that active and observant palæontologist it received a name, but was announced without any description or figure. In the Annals of Natural History for July, 1847, Mr. Jeffreys announced that he and Mr. Barlee had lately procured, by dredging off Skye, in forty fathoms, a few valves of a shell which he referred with doubt to the *Tere-*

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* An example of this species was found among Turton's shells, with the locality, "Torbay," attached. Unfortunately, no dependence can be placed in any statements of his respecting the indigenousness of any of our doubtful *Testacea*.

*bratula seminulum* of Philippi. During the summer of the same year Mr. M'Andrew procured a number of specimens of a minute *Terebratula* attached to a stone dredged in thirty fathoms' water off Croulin Island, near Skye. Some of these he forwarded to the meeting of the British Association at Oxford, where they were hailed with pleasure by zoologists and geologists as the living representatives of the supposed extinct crag fossil. They subsequently proved identical with Mr. Jeffreys's shell. Mr. Jeffreys has just communicated to us the interesting information that two specimens have been taken this summer (1849) by Mr. Barlee at the *haaf*, or deep-water fishing-grounds of Zetland.

# CRANIADÆ.

Through certain curious shells, belonging to extinct genera, we can trace a very gradual passage from *Terebratula* and its allies to the patelliform *Brachiopods*, constituting the family of which *Crania* may be regarded as the type. In this group the shell is either fixed to extraneous substances by the agglutination of one of its valves, or by a pedicle passing through a fissure or perforation in the lower valve. Most probably all the *Craniadæ* are in some stage of their existence affixed by a pedicle. The living members of the family all belong either to the genus *Orbicula* or to *Crania*. Species of both genera have lived during every epoch in the world's history, and maintained a striking resemblance to each other. Those of the former genus are wonderfully preserved, even in the very oldest fossiliferous strata, in consequence of the horny texture of their valves. At present, half a dozen *Orbiculæ* and half as many *Craniæ*, are the living representatives of the tribe, which, like other families of *Brachiopoda*, held a much more important position anciently in the population of the seas, than it holds now. None of the shells have true hinges or cardinal ligaments.

Dr. Carpenter describes the microscopic structure of the shell of *Orbicula* as closely resembling that of *Lingula*. He states, that it is almost entirely composed of laminæ of horny matter, which are perforated by minute tubuli, closely resembling those of ivory in size and arrangement, and passing obliquely through the laminæ. Near the margin of the shell these tubuli may be seen lying nearly parallel to the surface.*

### CRANIA, Retz.

Shell inequivalve, equilateral, orbicular; the upper valve patelliform, with an eccentric summit; wrinkled, smooth, or with radiating ribs or striæ (not sculptured in our native species); under-valve flat, imperforate, adherent by its entire external surface, fixed to various substances. No hinge or ligament. Four muscular impressions in each valve.

Animal with two large horizontal cirrhated buccal appendages, each forming a short spiral arm, curved inwards, free and unprovided with any skeleton.

This view of their relations is, however, on the point of being combated by the celebrated Danish naturalist, Professor Steenstrup, whose researches have, we believe, led him to the unexpected conclusion that the *Hippurites* and their allies are really related to tubicolous Annelida.

This very curious genus is better known in the fossil than in the recent state, though it is probable that all the fossil *Craniæ* are improperly associated in the same generic group. Those which have produced, and have free under-valves, should form a separate section, and in them we see a passage towards *Calceola* on the one hand, and the *Rudistæ* on the other, which would go far towards establishing the brachiopodous nature of those curious fossils.

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* Carpenter, Brit. Assoc. Rep. 1844.

### C. anomala, Müller.

Plate LVI. fig. 7 and 8 ; (animal) plate U. fig. 2 (as Norvegica).

*Patella anomala*, Müller, Zool. Danica, pl. 6.
„ *distorta*, Mont. Trans. Linn. Soc. vol. xi. p. 195, pl. 13, f. 5.—Fleming, Edinb. Encyclop. vol. vii. p. 65, pl. 204, f. 4.
*Anomia turbinata*, Dillw. Recent Shells, vol. i. p. 286 (in part).—Index Testaceolog. pl. 11, f. 2.
*Discina Ostreoides*, Turton, Dithyra Brit. p. 237.
*Crania personata*, Sowerby, Trans. Linn. Soc. vol. xiii. p. 471, pl. 26, f. 3.—Crouch, Introd. Lam. Conch. pl. 13, f. 3 (probably).
*Criopus anomalus*, Fleming, Philosoph. Zool. vol. ii. p. 499 ; Brit. Animals, p. 377.
*Crania rostrata*, Brit. Marine Conch. p. 125.
*Orbicula Norvegica*, Potiez and Michaud, Galerie de Douai, Moll. vol. ii. pl. 43, f. 1?—Brown, Illust. Conch. G. B. p. 69, pl. 22, f. 9, and pl. 20, f. 21, 22.
*Crania* „ Sowerby, Thesaur. Conch. vol. i. p. 368, pl. 73, f. 15, 16, 17.
„ *anomala*, Lovèn, Index Moll. Scandinaviæ, p. 29.

The upper or free valve of this interesting shell is depressed, conical, or umbrella-shaped, rather thin, or but moderately solid, either of a rufous brown, reddish chocolate, or paler or darker liver-colour, or else broadly rayed, with those hues upon a paler ground of the same tint, and is devoid of all sculpture beyond the mere wrinkles of increase. The shape is suborbicular, with a tendency to become subquadrate ; the vertex is acute, submarginal in most examples, but in individuals which have been uninterruptedly developed, subcentral (but not quite in the middle) ; there is generally also a slight indentation or straitening of that portion of the margin which is the nearer to it, or else of that portion immediately opposite the former. Internally the surface is more or less punctated or shagreened ; the upper or eye-like scars of the mask are decidedly large ; the lower or imaginary beardlike ones are still larger, almost, if not quite, united to each other, and each divided by a few somewhat radiating obscure groove-like indentations. The lower or attached valve, which is a mere coating of shelly matter, is not larger than the other, but, on the contrary, is entirely concealed by it. Its lower scars are large, ovate, and somewhat angular above; the upper ones are separate, ovate, and almost linked together in the middle; the rostellum or noselike intermediate portion is obtuse; the disk palmato-radiated; the margin thickened and somewhat scabrous. The diameter varies from half an inch to eight lines.

The animal was first figured and noticed by Otho Frederic Müller, who well styled it, "Vermis singularissimus," yet persisted in regarding it as an anomalous form of *Patella.* The arms are extended horizontally, each forming a rather short, graceful, plume-like curve, the fringed side being outermost. The fringes are long and rather stiff, and can be extended slightly beyond the shell. They are of a fleshy-white colour. When the upper valve is removed, the fringed arms are seen lodged in it. On the under-valve the ramifying ovaries, which are of a tawny hue, remain.

This curious bivalve was first added to the British lists by Dr. Fleming, who found it adhering to stones, from deep water in Zetland; since then it has been taken abundantly in several localities, chiefly on the west coast of Scotland. Off Arran in twenty fathoms (Smith); Loch Fyne in thirty to eighty fathoms, plentiful, on stones; off Mull in twenty and ninety fathoms; off Lismore in from twenty to thirty fathoms; off Armadale in eighteen fathoms; off Copenhaw-head, Skye, in forty fathoms; on the Ling banks off Zetland in fifty fathoms (M'Andrew and E. F.); Loch Alsh, Loch Carron, Ullapool, Oban, east of Lerwick, in forty fathoms

(Jeffreys). In Ireland it has been taken off Youghal by R. Ball, and off Cork by Humphreys.

It ranges throughout the Scandinavian seas.

## SPURIOUS.

### ORBICULA STRIATA, Sowerby.

*Discina Ostreoides*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 297 (no description).—Brit. Marine Conch. p. 125.
*Orbicula Norvegica*, SOWERBY (not Lam.), Trans. Linn. Soc. vol. xiii. p. 468, pl. 26, f. 2. — SOWERBY, Genera of Shells, Orbicula, f. 3, 4, 5.—REEVE, Conch. Systemat. pl. 129, f. 3, 4, 5.
*Discina* „ CROUCH, Introd. Lam. Conch. pl. 13, f. 2.
*Orbicula striata*, SOWERBY, Thesaur. Conch. vol. i. p. 366, pl. 73, f. 8.

*Locality unknown; found in ballast used to mend roads near London. Described by Fleming in his "British Animals," but avowedly as a very doubtful native.*

# SUPPLEMENTARY NOTES ON THE ACEPHALA.

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During the publication of our account of the British species of this class of Mollusks, some new matter of much interest has come to hand, and descriptions of several new tunicated forms made public. Instead of reserving them for the general appendix at the close of the entire work, we think it best to print such notes as are likely to be immediately useful in this place, at the close of the Acephala, and, at the same time, to correct some errors into which we had inadvertently fallen. Additional memoranda on species we shall reserve for our text explanatory of the plates, to be given at the close of the work.

## TUNICATA.

Although this order offers a rich harvest to the explorer of our shores and seas, little more has been published in addition to the account we gave in our first two numbers. In the valuable catalogue of the "Marine Mollusca of Northumberland and Durham," by Mr. Alder, that able naturalist, in conjunction with Mr. Albany Hancock, has given descriptions of several new, simple and compound Ascidians, which we here transcribe.

### SIDNYUM TURBINATUM.

"A species, which we had always taken to be this, is not rare on our coast, but it differs from that figured in Forbes and Hanley's 'British Mollusca.' It is inversely conical, sometimes adhering by a narrow base, and is of an orange-red colour, with the animals vertically and concentrically arranged: their branchial apertures are eight-cleft. The masses are of different sizes, from a quarter to half an inch high, erect, and frequently clustered."—Ald. *Cat.* p. 109.

### BOTRYLLUS RUBENS, Alder and Hancock.

"General envelope thin and transparent, dull brown, with numerous opaque yellow granules. Individuals forming circles, or stars, of from four to fifteen, generally averaging seven or eight; their colour is various shades of red, from reddish-yellow to dark brick-red: there is usually a circle of dark red round the branchial aperture, and at a little distance from it, and a streak of the same down the centre of the thorax; the remainder of the body is pale red or yellowish, thickly sprinkled with opaque yellowish-white spots. General aperture of each system, rather small. The stars are smaller, and not so closely set as in the last species.

"On the under side of stones between tide-marks, Cullercoats, frequent.

"We have occasionally seen the central red line of the body so much diminished that it leaves little more than a spot, and in that case the species might be taken for the last; but it may always be known from it by the thinness of the general envelope, and the more variegated reddish colour of the inclosed animals."—ALD. *Cat.* p. 110.

### B. VIRESCENS, Alder and Hancock.

"General envelope moderately thick, olive-brown coloured, sprinkled with yellow spots. Individuals forming circles of from six to twelve. Colour grass-green, varying to greenish yellow, and occasionally to pale grey; the colour is in most cases confined to the lower part of the animal, the upper portion being so nearly the colour of the envelope as to be with difficulty distinguished from it. Branchial apertures large, with a faint red margin; the tentacular filaments very conspicuous within them, of a pale yellowish colour. When magnified, the colour of the body is shown to be formed of a copious sprinkling of opaque spots, mostly confined, as before stated, to the lower part of the animal, but sometimes extending round the disc. Common central apertures largish, margined with red. Not uncommon on the under side of stones within tide-marks, along with the last. The arrangement of the markings distinguishes it from the *B. smaragdus* of Milne-Edwards."—ALD. *Cat.* p. 111.

### B. CASTANEUS, Alder and Hancock.

"General envelope very thin and pellucid, with a few scattered brown marks and black punctures on the margin. Individuals large, placed in irregular circles of from six to eight, of a chestnut colour, irregularly blotched with purple brown, and minutely sprinkled with opaque white. Branchial aperture small, general aperture moderate. Stars rather far apart, and surrounded with a few large opaque yellowish-white globular bodies.

"On the under side of stones, in pools, between tide-marks, Cullercoats, rare.

"The envelope of this species is thinner than in any other we are acquainted with, and, when removed from the stone, is extremely flaccid. The patches are large, being sometimes five inches across."—ALD. *Cat.* p. 111.

### BOTRYLLOIDES RADIATA, Alder and Hancock.

"General envelope yellowish-olive, with yellow granules. Individuals rather small, broadly pear-shaped, pale ochreous yellow or straw-colour, spotted with white, and having a paler rim round the branchial aperture, with rays diverging from it and uniting into a disc beyond, giving a petaloid or wheel-like appearance to it. A darkish line runs down the thorax. The systems are arranged in much shorter and more compact folds than in the last; some parts occasionally assuming the appearance of a circular arrangement. The common apertures are usually situated at no great distance from each other.

"On the under side of stones, among the rocks at Cullercoats and Whitley, frequent.

"The smaller size, more varied markings, and shorter and more rounded convolutions, distinguish this species from the last. The wheel-like markings ally it to the *B. rotifera* of Milne-Edwards, but the colour never approaches to red, and the folds of *B. rotifera* appear more elongated than in ours. In this respect our species approaches more nearly to the arrangement of *B. albicans*."—ALD. *Cat.* p. 112.

### B. RAMULOSA, Alder and Hancock.

"General envelope colourless, pellucid, with a few pale yellow spots on the margin. Systems of individuals winding, much involved; and having a broad cream-coloured belt down the centre, following the sinuations. Animals of an obscure brownish yellow, with the lower half pale opaque yellow.

"On the underside of stones, in pools, between tide-marks, at Cullercoats, rare. A. H.

"This species, which is in patches of upwards of an inch and a quarter across, is at once distinguished from *B. Leachii* by the opaque belt of cream-colour that passes along the centre of the various systems of animals."—ALD. *Cat.* p. 113.

### ASCIDIA SORDIDA, Alder and Hancock.

"Body ovate; of a dull semi-transparent yellowish white; nearly smooth, but coarse and with an uneven surface; attached by a narrow base. Apertures terminal and not far apart, papillose or very slightly tubular, more or less echinated or tuberculated; the branchial aperture eight-cleft, the anal six-cleft, with a red eye-spot at the base of each division. Outer tunic transparent, vitreous and colourless, rather tough, with very little power of contraction or expansion. Inner tunic about one-third less than the outer one, soft yellowish, and generally very much blotted and spotted with crimson, towards the upper end. Branchial sac, with small even reticulations a little thickened at the intersections. Circle of tentacular filaments simple and slender. Length about two inches; breadth an inch and a quarter; but very variable in size.

"This is one of the commonest *Ascidiæ* brought in on the fishing-lines at Cullercoats. It is usually attached to corallines; occasionally to shells and other substances. In its young state it is gregarious, and is found in clusters on *Genicularia loriculata*, and sometimes inside dead bivalve shells. It is then very transparent and hyaline; *Modiola marmorata* is occasionally found imbedded in the older individuals. This species may be the *Ascidia prunum* of Macgillivray, but not of Müller."—ALD. *Cat.* p. 106.

### A. albida, Alder and Hancock.

"Body ovate, white, transparent, and slightly tuberculated. Attached laterally by a narrow base to small sea-weeds. Branchial aperture lateral or subterminal, large but not very prominent, the margin divided into eight points with intermediate red ocelli. Anal aperture a little distant from the other, and nearly half way down the body, on the upper side; largish, and little prominent, with six red ocelli. Outer tunic hyaline and colourless, covered with distant small tubercles. Inner tunic transparent white with bluish lines on the upper part; below, opaque white slightly spotted with yellow. There is a large opaque white spot on the ganglionic prominence between the apertures, near which are a few small reddish marks. Length, half an inch; breadth, one-third less. On small sea-weeds brought in by the trawl-boats, with the last. Not uncommon."—Ald. *Cat.* p. 107.

### A. depressa, Alder and Hancock.

"Body oblong ovate, very much depressed, pale green; attached laterally through its entire extent by a distinct expansion or disc, surrounding the whole. Apertures distant; the branchial one terminal, not much produced, and divided into eight points, with intermediate red ocelli; anal aperture about two-thirds down the body on the left side, with six segments and intermediate ocelli. Outer tunic transparent, granulated or tuberculated on the upper surface, the granules sometimes a little incrusted with brown; under or attached side smooth and very thin. Inner tunic one-third less than the outer, yellowish green, of a deeper colour and sometimes inclining to orange in the lower part. The intestine is often very conspicuous, forming a dark sigmoid coil, but this is more or less the case in all the transparent species. Branchial sac finely reticulated, with tubercles at the intersections. Length nearly an inch. Common; attached to the underside of stones, among the rocks at Cullercoats and Whitley.

"This species comes very near to the *Ascidia orbicularis* of Müller (Zool. Dan. t. 79, p. 1, 2), but differs in the position of the apertures, which in that species are represented to be rather near together at the anterior end, while in ours they are widely separated."—Ald. *Cat.* p. 107.

### A. elliptica, Alder and Hancock.

"Body elliptical, a little convex on the upper side, and flat beneath, of a dull and sub-opaque brownish or yellowish white; attached through its whole length by a rather inconspicuous disc. Branchial aperture not quite terminal, at the anterior end papillose, very little elevated, and divided into eight tubercular segments. Anal aperture situated a little below the branchial one, on the left side, not prominent, with six tubercles. Outer tunic tough, sub-opaque, nearly smooth but rather coarse; inner tunic opaque white or flesh-coloured, with a few spots of red between the apertures. The red ocelli of the apertures, which are scarcely visible outside, are distinct in the inner tunic. Branchial sac reticulated with slender papillæ at the intersections of the larger meshes. Length, three-quarters of an inch; breadth, about one-third less. Attached to the under side of stones within tide-marks. Cullercoats. Not common."—Ald. *Cat.* p. 107.

### A. pellucida, Alder and Hancock.

"Body depressed, hyaline, subtriangular, attached laterally by a broad disc. Branchial aperture terminal, wide and tubular, divided into eight segments with red ocelli. Anal aperture situated a little below it on the left side, tubular and curved inwards towards the upper surface, with six ocellated segments. Outer tunic smooth, coriaceous, colourless and perfectly transparent. Inner tunic not above one-half the size of the outer one, opaque yellowish white, inclined to red on the lower part. Length half an inch. Under stones within tide-marks. Cullercoats, rare."—Ald. *Cat.* p. 108.

### Molgula arenosa, Alder and Hancock.

The species of *Molgula* which we have described and figured as the *Ascidia tubularis* of the "Zoologia Danica," is considered distinct by Alder and Hancock, who have given it the above very appropriate appellation.

### Cynthia coriacea, Alder and Hancock.

"Body elongated and cylindrical when extended, nearly hemispherical when contracted, of a pale brownish colour, attached to shells, etc. by a broad base, equalling the diameter of the body. Apertures terminal, approximating, tubular, nearly equal in size, pale, with a faint line of red round the margins. Outer tunic rough, coriaceous, transversely wrinkled and longitudinally furrowed, covered with minute granules. Inner tunic thin, white, sometimes spotted with brown. Ovaries large and white, lining the tunic with cylindrical convolutions. Branchial sac thin, with about ten longitudinal folds, and finely reticulated; the longitudinal fibres strongest. Length nearly an inch; breadth half an inch. From the fishing-boats at Cullercoats with the last, but less common.

"This species differs from the preceding in having both the apertures terminal, and placed near together, as well as in the minute granulations of the surface. It is capable of greater contraction and elongation than most of the other species, and in the two states, might be taken for different animals. It has sometimes small corallines attached, but we have not observed any *Modiolæ* imbedded in its skin."—Ald. *Cat.* p. 102.

In our account of *Salpa*, Dr. Fleming is stated to have observed great numbers on the coast of Caithness in the spring of 1821. It should have been "on the north coast of Sutherlandshire and the Hebrides," in autumn.

## LAMELLIBRANCHIATA.

In our plates of the animals of bivalves, there are three figures which are seriously in error. One is *Cyprina Islandica*, which, by an oversight of the engraver, is represented with the beak of the shell towards the siphonal extremity, instead of from it (see plate M. fig. 4.)—The second is *Turtonia purpurea* (plate O. f. 1), which should have the siphon projecting from the long end of the shell instead of the short one: of this animal a fresh figure will be given.—The third is *Xylophaga dorsalis*, respecting which curious mollusk we have received new and very important information and sketches of the animal from Mr. Cocks, of Falmouth. According to that excellent observer, the siphon is single and the anal aperture opens about one-third from the base. Crested ridges with pectinated edges, run from the root of the siphon to its extremity. The natural length of the siphon of one kept alive by Mr. Cocks, was one inch and a quarter. We shall give a fresh figure. In the body of the work, as well as upon the plate itself, the representation of that variety of *Astarte Danmoniensis,* which has a red interior (xxx. f. 5), is erroneously assigned to *A. triangularis.*

In a note at page 45 of vol. i., the genus *Clausina* of Jeffreys is stated to have been arranged by Mr. Gray among his *Tellinidæ.* This is a mistake; Mr. Gray placed it in his *Lasiadæ* and next to *Montacuta;* a position by no means unnatural. In our descriptions of the *Montacutæ,* the longer side of the shell is, by an oversight, described as the posterior extremity, which is contrary to the more correct statement put forward in the account of the animals. Since the commencement of our work, several important papers have been published bearing on this part of our subject, such as the memoir of M. de Quatrefages on *Teredo,* the controversy on *Kellia* between Mr. Alder and Mr. Clark, &c.; but on these and other points we reserve our notes until the conclusion of the work.

## PTEROPODA.

In warmer seas than those which encircle our islands, the surface of the water, when the weather is calm and the sun is shining, glistens with glassy needles or shelly bubbles. These, upon closer examination, prove to belong to curious mollusks, which, instead of creeping over submarine rocks and weeds, or burying in the soft mud and sand of the sea-bed, aspire to a gayer and more sportive life, and play the part of Neptune's bees and butterflies. From our less congenial waves they are almost altogether absent; only a few stragglers, and those, with one exception, of microscopic dimensions, have met even the scrutinizing eyes of practised naturalists.

These animals are mollusks of the group to which Cuvier gave the name of *Pteropoda*, so styling them on account of the wing-like lobes which form their organs of motion, and which appear really to be expansions of the organs regarded as a foot among the true sea-snails. Their organization is, however, so peculiar that zoologists have differed materially respecting their true position in the animal series, some, as Cuvier and Rang, placing them high up among the mollusca, intermediate between the sea-snails and the cuttle-fishes; others, as Lamarck, considering them as intermediate between the sea-snails and bivalves, and others placing them even below the acephala. A few high-standing names have maintained that they have no claim to a higher distinction than that of forming a tribe of Gasteropods allied to *Bulla* and *Aplysia*, and this opinion, which was advocated by De Blainville, has recently been supported by Souleyet, a naturalist who has had abundant opportunities for the study of them, and who has done much to elucidate their history.*

This is not the place to discuss the zoological status of a group of animals playing so unimportant a part in the British Fauna as the Pteropods do. Suffice it to say that on account of their inferiority of organisation, and at the same time the striking analogy they present with the embryonic forms of the majority of marine gasteropoda, to which in many of their features they have close relations of affinity, we are induced to assign to them in this work the position of an independent group superior to the *Acephala* and below the *Gasteropoda*.

The Pteropods are free and floating mollusca, swimming by means of the wing-like fins already alluded to. Some of them have shells and some are unprovided with such coverings; the latter have a more or less distinct head, and a rudimentary foot, which are denied to the former. The respiratory organs are external in the naked species, enclosed in a cavity in those with shells. They have a single heart. The viscera of their digestive system vary in the different genera: some are provided with curiously armed gizzards. The sexes are united. Their organs of sense are very rudimentary; the presence of otolitic vesicles has been demonstrated by Souleyet. Their nervous system is less highly developed than that of the *Gasteropods*.

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* See an abstract of M. Souleyet's Researches in the "Comptes Rendus" for October, 1843.

Our few British species are all members of the shelled division of the order, and belong to two different families, viz., the HYALEADÆ characterised by their corneous sheath-like, more or less triangular shells, and the LIMACINADÆ, whose bodies are enveloped in regularly spiral shells, reminding us closely of those of many *Gasteropoda*.

## HYALEA, FÉRUSSAC.

Shell thin, corneous or glassy, smooth or furrowed, more or less globular, with a spine or angle at each side, and one forming its posterior termination; sides split, mouth transverse, anterior, one of the lips overlapping.

Animal with a globular body, having two wing-like lateral expansions which are projected from the slits at the sides of the shell, and a broad expanded two-winged natatory disk, extending on each side of the anterior extremity. Head not distinct. Branchiæ lodged in a special cavity. No operculum.

The *Hyaleæ* are oceanic, and on account of their size and colour are easily distinguishable in the water, especially when the animal expands its swimmers and fins. It is by no means improbable that more than one species may occasionally visit the western shores of Britain, and those naturalists who may meet with the fleets of *Ianthinæ* and *Velellæ* which are occasionally wafted on shore in the west of Ireland, the Hebrides, and the south-west of England, would do well to search carefully among the débris, lest *Hyaleæ* and allied Pteropods may accompany floating animals which are their constant companions in seas more to the south.

### H. TRISPINOSA, Lesueur.

Plate U, fig. 3.

Davila, Cat. Cabinet, vol. i. pl. 20, f. e, ?
Chemn. Conch. Cab. vol. viii. p. 65, vignette 13, f. c. d.
*Hyalea trispinosa*, Lesueur, MSS. in Blainv. Dict. Sc. Nat. vol. xxii. p. 82.—Thompson, Ann. Nat. Hist. vol. v. p. 13; Report Brit. Assoc. 1843, p. 249.—Quoy and Gaym. Voy. Astrol. vol. vii. p. 378, pl. 27, f. 17, 18, 19.—Desh. Encycl. Méthod. Vers, vol. ii. pt. 2, p. 310; Lam. Anim. s. Vert. vol. vii. p. 417, 421.—Cuv. Règne Anim. (ed. Griffith) pl. 3, f. 7. — D'Orbig. Moll. Cuba, p. 81. — Philippi, Moll. Sicil. vol. ii. p. 71.
„ *mucronata*, Quoy and Gaym. Ann. Sc. Nat. vol. x. p. 231, pl. 8, 13, f. 1. 2! (fide Desh.)
„ *triacantha*, Guidotti, in Bronn Ital. p. 85 (fide Philippi), fossil.
„ *depressa*, Bivona, teste Philippi, Moll. Sicil. vol. i. p. 101, pl. 6, f. 19, fossil.
*Hyales à trois pointes*, Chenu, Traité Elem. Conch. p. 125, f. 403, 404.

The only indigenous example of this fragile shell having inadvertently been crushed, our description has necessarily been derived from foreign examples, one of which was the specimen sent to us by Mr. Robert Ball as identical with the individual, from whose discovery by himself, the species has been introduced into the British Fauna.

The shell is of a more or less transparent white, partially stained with brown or vinous red, especially near the lips, and at the commencement of the tail. It is depressed, straight (not curved), and kite-shaped: the anterior extremity, or the portion above the short, but very acute, lateral spines, one of which runs out nearly at right angles, or with a slight descending inclination, to the body on each side of it, is much shorter than the posterior end; the latter is produced into a very long and slender straight caudal spine, which, however, is very rarely procured in an unbroken state. The labial aperture is short, narrow, and semielliptic, the marginal fissure, which extends to the tips of the lateral spines is delicately linear; both lips are briefly and abruptly reflected.

The upper and lower surfaces are of nearly equal convexity, and are both of them, more frequently than otherwise, devoid of well marked concentric striæ. The former projects semicircularly, but only slightly, beyond the straightish anterior or labial edge of the latter, and is adorned with a broad rounded central fold, which is generally, if not always, subdivided in front into three smaller ones, flanked on each side with a strong but narrower fold, which leaves a flattish triangular space between it and the termination of the lateral spine. Merely a slight fold adjacent to each lateral spine is observable upon the lower superficies. The posterior edges, previous to the commencement of the caudal spine, which when perfect is at least equal in length to the space from its origin to the lateral aculeations, and tapers with extreme slowness, run towards each other subrectilinearly and nearly at right angles. The specimens we have described from, measure at least five lines in length, and three and a half in breadth from prickle to prickle.

The circumstances under which this shell has been taken are as follows. About the year 1820 a large mast floated into Youghal, covered with *Anatifa lævis*, and perforated by *Teredines.* From the water in which the sawn-off end had been laved, Mr. Robert Ball of Dublin obtained a *Spirula* and a *Hyalea;* the latter shell was still filled with animal matter, although life was extinct in the Pteropod. From the roving habits of the genus, it is by no means improbable that many more examples have at times been wafted upon our shores, but perished through their extreme fragility, before attracting observation.

### SPIRIALIS. Eydoux and Souleyet.

Shell thin, transparent, of several spiral whorls, coiled sinistrally, spire elevated or depressed, surface smooth or (in some foreign species) reticulated, mouth angulated below or canaliculated, sometimes prolonged into a spine-like curved beak.

Animal elongated spiral, head not distinct; two fin-like expansions united at their base by an intermediate lobe bearing an operculum; branchiæ in a cavity formed by the mantle. Operculum vitreous, very thin and transparent, of few whorls.

This genus was constituted in 1840 * by the naturalists attached to the exploring ship Bonite, for some curious minute oceanic Pteropods with which they had met during their voyage. They were the first to meet with and describe the animal inhabitants of certain little sinistral fusiform shells, which had been placed in *Atlanta* by Alcide d'Orbigny, but which had evidently no affinity with the *Nucleobranchiata*. Long before, one of these from Rimini in Italy had attracted the notice of Spengler and been figured by Chemnitz,† and another had been described and figured as a reversed form of *Fusus* by Dr. Fleming. In 1842 one of the authors of this work founded a genus under the name of Peracle for a remarkable minute shell dredged at great depths in the Ægean, and at the Cork meeting of the British Association referred Dr. Fleming's *Fusus retroversus* to the same genus, giving reasons why they should be considered Pteropods, unaware of their true position in that group having been already discovered and published by the French naturalists already cited. About the same time Dr. Philippi constituted his genus SCÆA for a shell very similar to the Ægean *Peracle physoides.*

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* Revue Zoologique Soc. Cuv. 1840, p. 235.

† Chemnitz, Conch. Cab. vol. ix. pl. 113.

MM. Eydoux and Souleyet have described six species of this genus, and of all these have examined the animals. In all they found them furnished with a pair of elongated swimmers, rounded and not bilobed at their extremities, and an intermediate lobe of semicircular shape at the union of which with the other two lobes the mouth, furnished with two little labial elevations, is situated. The opening of the vent was seen at the right side of the mantle; the reproductive organs were not clearly made out. We have copied (in our Plate U, fig. 4) one of the figures of these curious animals given in the Atlas to the voyage of the Bonite, in the hope of directing the attention of British naturalists, who may be so fortunate as to meet with living individuals of our native species, to their generic peculiarities.*

"These Pteropods," say the authors cited, "are distributed through all seas, and we have equally met them in the Atlantic, the Indian, and the Pacific oceans, and in the Chinese seas."

*Spirialis* is evidently nearly allied to the old genus *Limacina.*

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* In the plate this figure is given under the name of *Peracle*, a generic appellation, which, for reasons stated above, must give way to *Spirialis.* We had been misled by the date of the plates in the voyage of the Bonite.

### S. Flemingii, Forbes.

With the body whorl very ventricose; the spire of four whorls, but not forming half the length of the shell.

Plate LVII. fig. 4, 5.

Chemn. Conch. Cab. vol. ix. pt. 1, p. 129, pl. 113, f. 972, 973 (?).

*Fusus retroversus*, Fleming, Mem. Wern. Soc. vol. iv. p. 498, pl. 15, f. 2. ; British Animals, p. 349 ; Treatise on Mollusc. Animals (from Encycl. Brit.), pl. 12, f. 45.—British Marine Conchology, p. 201.

*Scæa stenogyra*, Philippi, Moll. Sicil. vol. ii. p. 164, pl. 25, f. 20 (probably).

*Peracle Flemingii*, Forbes in Brit. Assoc. Report, for 1848, p. 249.—Jeffr. Ann. Nat. H. vol. xx. p. 16.

This very minute shell—it is not very much larger than an ordinary pin's head—was discovered by Dr. Fleming, and, from its striking resemblance to many species of the genus, was considered by him as a reversed *Fusus*. It is very thin, transparent, shining, smooth, of a clear horn colour, and more or less iridescent when living, of a porcelain white when dead. Its general outline is not unlike that of a boy's peg-top. The body-whorl is very ventricose, and short in proportion to its breadth; it exceeds in vertical length the entire pyramidal spire, which is composed of four very narrow, well defined whorls, that terminate in an extremely small, but blunt or even depressed point. These volutions are rounded, but are so far subangulately flattened above, as to appear obtusely subscalariform. The base is rounded, but is still a little depressed, that is to say, the attenuation is rather abrupt. The mouth is narrow and ear-shaped; it occupies at least half the length of the shell, but is not equal to half the basal diameter; it is attenuated and effuse at the bottom, and not truncated, as it seems in our engraving.

The outer lip is simple, arcuated above, and subrectilinear below; the inner one is straightish, and by its reflection conceals the umbilical chink.

The *Spirialis Flemingii* was met with by its discoverer among shell sand collected in Noss Island, Zetland, after a storm in the spring of 1809. He rightly observed that it was not the fry of a large shell. In 1840 more specimens were found by Mr. Hyndman among shell sand collected by Mrs. Hancock at Bundoran on the coast of Donegal. In 1848 Mr. M'Andrew dredged dead specimens in sixty fathoms of water, fifteen miles from Mizen Head, south of Ireland. It was afterwards taken off Arran in Ireland, in Skye and Zetland, and at Guernsey, by Mr. Barlee.

The *Spirialis ventricosa* of Eydoux and Souleyet is nearly allied to our species.

### S. MacAndrei, Forbes and Hanley.

Turreted-fusiform, the body whorl not equal in length to the spire.

Plate LVII. fig. 6, 7.

? ? *Turbo lunaris*, Gmelin, Syst. Nat. p. 3587, from Chemn. Conch. Cab. vol. ix. p. 128, pl. 113, f. 971 (broken ?).

This tiny shell is very minute, thin, and pellucid, and of a horn colour. The surface of the whorls is quite smooth and shining. The general shape is lanceolate and less than one half of the length is occupied by the body-whorl, which is not swollen out as in the last species, but gently tumid. The spire is formed of five whorls that very gradually decrease; they are slightly tumid, and rather narrow. The terminal whorl forms an obtuse apex. The mouth is somewhat elliptical, and rather narrow; it terminates below in a short canal, which is slightly bent, but not mucronated.

We owe the discovery of this curious addition to our Fauna, to Mr. M'Andrew who, in June 1848, dredged several specimens along with the preceding species in sixty fathoms of water, fifteen miles to the south of Mizen Head, south of Ireland.

Its nearest ally appears to be the *Spirialis Bulimoides* of D'Orbigny.

### S. JEFFREYSII, Forbes and Hanley.

Shell subdiscoid, spire much depressed, lip very acute, mucronated.

Plate LVII. fig. 8.

This curious shell is easily distinguished from its British congeners by its very much depressed spire. It is very minute, very thin, fragile, and transparent. There are three whorls, the outermost of which is large in proportion and gently rounded; the second is slightly elevated above it, and the third very slightly above the second, so that its termination forms a somewhat acute apex. The surface of the whorls is quite smooth. The mouth is elliptically ovate; its outer lip is thin and gently curved; the inner terminates in an acute, rather short, canaliculated, somewhat curved cauda or mucro.

The only specimen we have seen is contained in the cabinet of its discoverer, Mr. Gwyn Jeffreys, who found it on the shores of the British channel. It is nearly allied to the *Spirialis rostralis* of Eydoux and Souleyet, a species said by them to be very common in the ocean, and occurring in myriads.

# GASTEROPODA PROSOBRANCHIATA.

The great majority of our marine univalve shells are the body-coverings of sea-snails which have the lower part of their bodies formed into a thickened creeping disk or foot, and their organs of respiration lodged, in the shape of comblike gills, in a vaulted pallial cavity; except a few genera, which have these organs lining, as it were, the inner margin of the mantle. The shell is partly devoted to the protection of the gills and partly to that of other viscera. The heart is in most of them placed behind the gills. The sexes are distinct. In common with all other gasteropods which breathe by branchiæ they affect in their larva state a form reminding us of the *Pteropoda*, being then furnished with broad ciliated fins springing from the sides of the head. Their shells, except in a few instances, are spiral, and the larvæ appear to be always furnished with spiral shells, whatever shape these important appendages may eventually assume.

The term *Prosobranchiata* was proposed for these mollusks by Milne Edwards,* who constitutes of them his second order of Branchiferous Gasteropods. Availing ourselves of the views promulgated by that eminent zoologist, respecting the classification of the Gasteropoda—

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* Sur la Classification Naturelle des Mollusques Gasteropodes, Annales des Sciences Naturelles for February, 1848.

views which seem to us a great advance on previous classification — we adopt this very natural section, preferring, however, to regard it and the parallel section *Opisthobranchiata* as equivalents of the *Gasteropoda Pulmonifera.*

The shells of *Gasteropoda* do not present those dissimilarities of structure which render the microscopic study of bivalve shells so interesting of late years. They have been carefully investigated by Mr. Bowerbank,* and by Dr. Carpenter,† and had previously been inquired into by Mr. Gray. They appear, for the most part, to be made up of three distinct layers, uniformly constituted, but alternating in disposition. Each layer is composed of plates, each of which is made up of parallel prismatic cells. *Patella*, *Chiton*, and a few other genera, present slight exceptions to the general rule. In the excellent memoir by Dr. Carpenter, just referred to, a full account of all that has been done on this subject may be found and studied with advantage.

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* Microscopical Society's Transactions, vol. i.

† British Association Reports for 1847.

# CHITONIDÆ.

"It seems to me," writes Milne Edwards in the short but valuable paper to which we have just referred, "that the animal kingdom, taken as a whole, cannot be compared with a well-regulated army, where each brigade, each regiment, and each company, has well-defined limits, and where every soldier has his fixed place under the flag of his corps; to give a just notion of it, it might better be compared to the stellary system, where a multitude of stars are disseminated at unequal distances, and form, from distance to distance, by their presence in great number within limited spaces, groups more or less remarkable, about which we see other stars, isolated as it were in the heavens, and not making part of any great system. The analogues of these constellations, in zoology, constitute classes and orders, and in the voids between them we often find some species which differ as much from all these groups as they differ among themselves, but which, being few in number, are not permitted to assume the same rank in our classifications as types do which are rich in species."

These sentiments are offered as illustrative of the family before us, which is considered by Milne Edwards as even doubtfully belonging to the mollusca, and at nearest, as a satellite group of *Gasteropoda* having relations to the *Prosobranchiata*. The Chitons have, indeed, been zoological puzzles, though regarded by the majority of malacologists as members of their special province. Cuvier held them to be gasteropods closely allied to *Patella* with which genus he associated them to form his sub-order *Cyclobranches.* De Blainville, on the other hand, considered them as more nearly allied to Annellida than to mollusca, and constituted a special group *Polyplaxiphora* for them. Unlike any other mollusks their bodies are protected by a series of shelly plates, resembling so many articulations. Their organs of reproduction are symmetrical, and repeated on each side of the medial line, and there are a pair of sexual orifices. Their circulation is peculiar; the heart resembles the dorsal vessel of an annellide. On the other hand, their respiratory organs are very similar to those of *Patella*, their digestive system and lingual apparatus remind us of those of Prosobranchiate mollusks, and the creeping disk is that of a true Gasteropod. As our knowledge stands at present, we prefer to regard them as an abnormal family of *Prosobranchiata*, and trust, before long, that some active observer resident by the coast will occupy himself with studying the development of the *Chitons*, and endeavour to ascertain the form they assume in their larval condition. Whoever does so will make an important discovery, and do more towards fixing the true position of these anomalous creatures than all cabinet examinations of them have yet enabled us to effect.

In a recently published paper by Mr. J. E. Gray, the *Chitons* are maintained to be "normal Gasteropods, with a series of more or less rudimentary valves in front of the usual shell." He considers the posterior terminal valve to be the homologue of the shell of *Patella*.

### CHITON, Linnæus.

Shell oblong, composed of eight transverse plates, imbricating, variously ornamented on their surfaces; all lodged in a coriaceous mantle which forms an expanded, smooth, shagreened, wrinkled, granulated or spiny margin all round the body.

Head of the animal obscurely defined, formed of a proboscis covered by a fleshy semicircular hood, no tentacles nor eyes; buccal mass with cartilaginous jaws, lingual ribband long and linear, furnished with numerous transverse series of teeth, of which three in each series belong to the rachis, flanked on each side by a single large uncinated lateral tooth and a supplementary lateral, the last arising from among five polygonal flanking plates. Branchiæ forming a series of lamellæ between the mantle and foot on each side; foot an oblong disk, rounded at each extremity.

These curious mollusks constituted part of the "multivalves" of old conchologists, and cannot be mistaken for members of any other genus or tribe. They are distributed all round the world, and the species are very numerous; often very curious and even beautiful. They live attached to rocks, stones, and shells; more rarely are they found creeping on sand. They inhabit various depths of water; the majority of species are littoral or sublittoral, but a few range to great depths. From their fragility few traces of fossil species might be expected to be found; nevertheless, even as far back as the palæozoic epoch it would appear that *Chitons* were in being.

We retain the genus *Chiton* in its original signification, deeming that, in the present imperfect state of our knoweldge of the soft parts of the several species, a separation of them into groups of generic value on account of slight differences in the shelly valves or ornamental surface of the mantle is, to say the least, premature. On such differences, however, good sections of the genus may be founded, and in such light we regard the divisions proposed by Mr. Gray and others. The most important contribution to a scientific knowledge of this genus is the recently published Memoir on Russian Chitons by our distinguished friend Dr. Middendorff, in which the species coming within range of his theme are investigated with a minuteness and skill which cannot be praised too highly. This author is the first to notice a characteristic of the greatest value in the determination of species, but one which, being taken from the soft parts, has been neglected by conchologists, viz. the number of branchial laminæ and the extent occupied by them. Our own observations and those of Mr. Clark confirm, so far as they go, the value assigned to this character by Middendorff. A still more minute character—the form of the teeth, especially the central one, on the lingual ribband is also of great specific importance in *Chiton*, though difficult to observe. We owe the indication of it to the admirable researches of Professor Lovèn on the lingual teeth of Mollusca [*]—researches which will do much towards a right understanding of the genera and families of Gasteropoda, and of which we intend fully to avail ourselves in the future portion of our work.

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[*] Öfversigt af Kongl. Vetenskaps-Academiens Förhandlingar. June, 1847.

### C. FASCICULARIS, Linnæus.

Valves irregularly shagreened; granules coarse and few; ligamental border with tufts of bristles.

Plate LIX. fig. 5.

*Chiton fascicularis*, LINN. Syst. Nat. ed. 12, p. 1106 (probably).—PULTENEY, Hutchins, Hist. Dorset, p. 25.—MONT. Test. Brit. p. 5; Suppl. pl. 27, f. 5.—MAT. and RACK. Trans. Linn. Soc. vol. viii. p. 21, pl. 1, f. 1.— RACK. Dorset Catalog. p. 25, pl. 1, f. 1.—TURT. Conch. Diction. p. 34, f. 9.—LOWE, Zool. Journ. vol. ii. p. 96.—FLEMING, Brit. Anim. p. 288. —JOHNSTON, Berwick Nat. Club, vol. ii. p. 37.—MACGILLIV. Moll. Aberd. p. 183.— Brit. Marine Conch. p. 128.—BROWN, Illust. Conch. G. B. p. 65, pl. 21, f. 5, 8. —SPENGLER, Skriv. Nat. Selks. Kiobenhg. vol. iv. pt. 1, p. 81, in part. — DILLW. Recent Shells, vol. i. p. 8 (chiefly).—LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 492 (partly).—SOWERBY, Conch. Ill. Chiton, spec. 1, f. 87.—Conch. Man. f. 506 (magnif.).

*Chiton crinitus*, PENNANT, Brit. Zool. ed. iv. vol. iv. p. 71, pl. 36, f. 1; copied in Chemnitz, Conch. Cab. vol. viii. vignette, p. 252.—MONT. Test. Brit. p. 4.—MAT. and RACK. Trans. Linn. Soc. vol. viii. p. 20. — TURT. Conch. Diction. p. 35. — BROWN, Illust. Conch. G. B. p. 65, pl. 21, f. 7.—WOOD, General Conch. p. 23. — DILLW. Recent Shells, vol. i. p. 13. — REEVE, Conch. Iconic. vol. iv. Chiton, pl. 26, f. 176.

As both this and *discrepans* inhabit the Mediterranean, it is uncertain, from the brief diagnosis in the "Systema Naturæ," which of them was the Algerine species designated *fascicularis* by the illustrious Linnæus. In retaining that name for the present species, we follow the stream of preceding writers, being unwilling to disturb an accepted name without absolute necessity for so doing. The shape is elongated or produced oblong, and the back, which is more or less carinated, is depressed in the more typical examples. The posterior edge of the valves is beaked in the middle, and but moderately incurved at the sides; the last valve is very short and narrow, and the fall from its mucro rather abrupt. There are no distinct defined lateral and central areas, but the entire exterior of the several plates is adorned, except upon the dorsal ridge, which is usually marked with coarse wavy longitudinal striæ, or (often interrupted) raised sulci, with rather large flat-topped more or less tear-shaped separate granules, that either do not preserve any regular arrangement, or else, keeping their pointed ends towards the beaks, seem consequently to radiate in some little degree from them. The margin which is tolerably broad, yet not so dilated as in the succeeding species, is somewhat spinosely hairy, and is, besides, armed with eighteen tufts or fascicles of crowded bristles, that are extremely numerous, of but moderate length, and of a pink or yellowish white tint. Four of these fascicles precede the first valve, the rest are situated at the junction of the several plates of which the *Chiton* is composed. The general colour of the shell is of a greenish or olivaceous ash, occasionally mottled with liver-brown, sometimes pure white or flesh-colour, sometimes mixed white and chocolate brown upon the dorsal ridge; and more rarely of a dull crimson, or variegated with crimson and white.

This is a much smaller species than the one next described, and very rarely exceeds three quarters of an inch in total length.

Mr. Clark has communicated a detailed account of the animal. "The foot is suboval, very little angular in front, and slightly but obtusely tapering behind. The under part of the mantle is of a red brown colour. Between the foot and the mantle is the branchial cordon, consisting of fifteen oblique cord-like, short, close-set, pale brown filaments on each side, commencing close to the posterior extremity, leaving only room between the series for the anal aperture. This cordon does not quite extend half the length of the body on each side; the filaments gradually diminish in size from the posterior end, and at the anteal termination are not more than half the length of the hinder ones. The head is a semicircular puckered frill, within which is the circular rugosely-rayed disk of the mouth, with the round orifice in the centre. There are certainly no tentacula, and no eyes could be detected; the buccal apparatus consists of two elliptical white or pale yellow corneous plates, between which is a rather long black strap-shaped tongue armed with two lines of tubercles, the inner edges being tricuspid; at the base of the corneous plates is a nervous cordon of five minute yellow round ganglia; the tongue is enclosed in a muscular œsophagus, which enters a very complicated stomach and intestine of four or five convolutions, compacted together by various turns, which, from their complexity, can scarcely be described, as they lie in a space of little more than one-eighth of an inch; at the last turn it passes into a rather long rectum, disemboguing in the centre of the posterior branchial filaments. The convolutions can easily be drawn out, and with the œsophageal canal and rectum form an extent of nearly two inches. The folds of the liver and ovarium are immediately under the mantle and occupy nearly the whole concave space to the head."—We may add that the axile denticle of the tongue in this species is oblong quadrate, with an entire uncinated apex. The first laterals are very broad and bear strongly hooked dark-coloured apices.

This species is found under stones at low water, and on stones and shells to a depth of twenty-five fathoms. It is, in the main, an inhabitant of the littoral and laminarian zones, and though seldom occurring in abundance, is so generally distributed all around our shores, that to enumerate localities would be superfluous. It ranges northwards to the shores of Norway, and southwards to the Mediterranean. Some remains of *Chitons* in the coralline crag are doubtfully referred to *fascicularis* by Mr. Searles Wood.

### C. DISCREPANS, Brown.

Valves with numerous fine, irregularly disposed, granules; ligamental border with tufts of bristles.

Plate LVIII. fig. 4.

*Chiton fascicularis*, WOOD, General Conch. pl. 2, f. 6 (probably).—PHILIPPI, Moll. Sicil. vol. i. p. 108, pl. 7, f. 2 (var. major).—REEVE, Conch. Icon. vol. iv. Chiton, pl. 10, f. 53.
„ *crinitus*, SOWERBY (not Pennant), Conch. Ill. Chiton, spec. 2, f. 88 to 91.—Brit. Marine Conch. p. 251.
„ *discrepans*, BROWN, Illust. Conch. G. B. p. 65, pl. 21, f. 20.

We have preferred the name given to this species by Brown, to the generally accepted one of *crinitus*, an epithet revived by Mr. Sowerby in his excellent iconographic monograph of the British *Chitons*. For, independently of the disqualifying obscurity of the definition, the northern locality, and the small dimensions attributed to his species by Pennant—who naturally would be better acquainted with the more abundant *fascicularis*, with which we regard his seven-valved *crinitus* as identical—forbid our attaching the name of that author to the shell we are about to describe.

This *Chiton* bears so close a resemblance to the preceding species as to render its discrimination a little difficult; the smaller size and rather different shape of the granules, the elevation and comparative smoothness of the dorsal ridges, and the greater proportionate breadth of the margin are the more striking features of distinction. It is of a produced oblong shape, acutely carinated, moderately beaked and not particularly depressed. Its valves are shield-shaped and much contracted in front, permitting the margin to run up considerably between each valve. The general colouring is variable, dirty-flesh colour marbled with olivaceous angular lines or markings being the most common; frequently, too, it is pale greenish passing into yellowish ash, and the olive-brown markings somewhat clouded; the dorsal ridges, or beak-like series of lanceolate cappings, which are distinctly elevated above the granular surface, are either smooth or finely striated, and occasionally are of a jet black. The hinder, or external edges, are but little incurved. The sculpture is precisely that of *fascicularis*, but the grains are infinitely smaller, closer, and more numerous (although the shell itself is much larger), and are either subcircular or rounded oval, instead of tear-shaped; their arrangement, too, is not precisely identical, as for the most part, although not united into chains, they run somewhat parallel to the dorsal ridge. The margin is very broad, is beset with sea-green somewhat glassy hairs, and with eighteen pale tufts of crowded bristles similarly disposed as in the last species.

Specimens from the little islet of Herm, near Guernsey (where the shell, which is very abundant in cavities of the rocks, at low water, seems to replace *fascicularis*, which we never met with there), measure an inch and a-half in length and three-quarters of an inch in breadth, even after the great contraction which they experience in drying. (S. H.) Found at Tenby, by Mr. Lyons, according to Brown.

It is truly a southern species, and ranges to the Mediterranean.

## C. Hanleyi, Bean.

Granules of the central areas moniliformly disposed; ligamental border aculeated.

Plate LXII. fig. 2.

*Chiton Hanleyi*, Bean, in Brit. Marine Conch. p. 262, f. 57.—Alder, Cat. Moll. Northumb. and Durh. p. 73.—Thompson, Ann. Nat. Hist. new ser. vol. iii. p. 352.—Lovèn, Ind. Moll. Scandinav. p. 27.—Reeve, Conch. Iconica, vol. iv., Chiton, pl. 28, f. 187, 190.

This rare and interesting *Chiton* was first discovered by Mr. Bean, of Scarborough, who named it in honour of one of the authors of the "British Mollusca." Although so lately detected, it has since then been taken in Finmark and other places in the North of Europe.

It is small, of an oblong, or produced oblong, shape, moderately elevated and angular above, and either of an uniform whitish or tawny brown tint, but more frequently slightly tinged with the latter colour. The valves are not polished, and have their hinder edges only slightly retuse; the first is rather large; the breadth at the fifth plate is about five and a-half times the length of the exposed portion of that valve. The dorsal ridge (the highest part of the shelly plates) is neither distinguished by colour nor any other particular from the rest of the surface; the mucrones or beaks are short but distinct; that of the last valve is a little rounded, and as it is not terminal, the posterior slope is not abrupt. The sculpture is peculiar, and for the size of the shell rather coarse. It consists, upon the central areas, of rather distant and not very numerous longitudinally disposed moniliform rows of granules, that become larger as they recede from the middle of the valves; upon the anterior plate, and upon the lateral areas, which are neither specially indicated by a marginal line nor superior elevation, of large papillæ, which, if exhibiting any arrangement at all, are set rather concentrically than otherwise, and are so much raised as almost to appear pedunculated. The latter are very deciduous, especially on the posterior edge, which, before their obliteration, almost presents a dentated appearance. The ligamental border, which is not broad, is covered with bristle-like aculeations, and, according to Lovèn, has additional tufts of rather longer ones at the posterior corner of the inserted valves.

Few British examples measure more than a quarter of an inch long, and about the seventh of an inch broad; foreign specimens are decidedly larger.

In England this rare shell has been taken attached to the under sides of rocks at the lowest spring-tides, Scarborough (Bean); Cullercoats in twenty fathoms (Alder). In Scotland it has been dredged in twenty fathoms east of Mull, on a gravelly bottom (M'Andrew and E. F.); in from seventy to eighty fathoms, forty miles from land, east of the Noss, Zetland (M'Andrew); at Oban, Skye, Zetland, and upon the West Coast of Ireland (Barlee).

It is recorded by Lovèn among Scandinavian species.

### C. RUBER, Linnæus.

Valves of a shining red, perfectly smooth, or with only strong concentric lines upon the lateral areas; border delicately farinaceous, articulately spotted with red and white.

Plate LIX. fig. 6, and (Animal) Plate AA, fig. 6.

*Chiton ruber*, LINN. Syst. Nat. ed. 12, p. 1107.—LOWE, Zool. Journ. vol. ii. p. 101, pl. 5, f. 2.—FLEMING, Brit. Anim. p. 289.—JOHNSTON, Berwick Club, vol. ii. p. 38.—Brit. Marine Conch. p. 129.—BROWN, Ill. Conch. G. B. p. 66, pl. 21, f. 6, 9.—CHEMN. Conch. Cab. vol. viii. p. 288, pl. 96, f. 813.—WOOD, Gen. Conch. p. 14.—DILLW. Recent Shells, vol. i. p. 6 (not var.).—SOWERBY, Conch. Ill. Chiton, sp. 8, f. 103, 104.—GOULD, Invert. Massach.

p. 149, f. 24.—DEKAY, New York Fauna, Moll. p. 165.—MIDDEND. Malac. Rossic. Chit. p. 117.—REEVE, Conch. Icon. vol. iv. Chiton, pl. 26, f. 175.

*Chiton cinereus*, O. FABR. Fauna Grœnl. p. 423 (fide Midd.). — MAT. and RACK. Trans. Linn. Soc. vol. viii. pl. 1, f. 3 (probably; not desc.).

„ *minimus*, SPENGLER, Skriv. Nat. Selks. Kiobenhag. vol. iv. pt. 1, p. 95 (fide Lovèn).

„ *lævis*, LOVÈN, Index Moll. Scand. p. 28.

Of the earlier known and imperfectly characterized species of *Chiton* this is the one that, from an examination of the Linnean types, we are enabled to identify with the greatest certainty. As a British species, however, it was not distinctly indicated, until the publication of Mr. Lowe's admirable paper on this genus, in the Zoological Journal for 1825, although apparently designated in cabinets by the correct appellation, and delineated in all probability in the Linnean Transactions for 1807 as *C. cinereus.* It is of an oval-oblong shape, only moderately angulated above, not much elevated, and invariably of a dull scarlet, red, or tawny rufous hue, mottled or variegated with white markings, which, in the more characteristic examples are flexuous, linear, and disposed in obliquely longitudinal waves. The posterior edge of the plates is decidedly beaked in the middle, but not much incurved laterally. The surface of the valves, not of the ligamental margin that connects them, is shining, and so smooth as not to exhibit any trace of granules under the most powerful lens; there are, however faint (and in some examples almost obsolete) arched concentric lines of growth, which are generally more apparent at the sides than elsewhere. The lateral areas are tolerably defined by the comparative flattening of their surface, but are not otherwise indicated. The mucrones do not differ in substance from the rest of the shell. The connecting border is broad, so that the proportion of that on each side of the shell is unitedly, at the fifth plate, as one to four; it is delicately farinaceous, and articulately painted with brick-red and ashy-white, so arranged, for the most part, that the latter tint is chiefly apparent (and usually in narrow strips) in a line with the sutures of the valves.

Mr. Lowe remarks that the insertional teeth are nine on the first valve, ten on the last, and two on the intermediate ones.

The soft parts of the animal are of a flesh-red colour. The branchial leaflets on each side extend very nearly to half its length, and are about twelve in number. The under-margin of the mantle is rather broad in proportion to the foot, and the space between the mantle and foot very narrow. Each series of branchial leaflets is also very narrow. The hood of the head is narrow and slightly extended at the angles. Lovèn has described and figured the lingual teeth. The axile denticle is oblong quadrate, the large hooked laterals bear incurved tridentate summits, which, however, are not very broad and have nearly equal denticulations.

This species is generally distributed through the British seas, but seldom taken in great plenty. It is occasionally and not uncommonly found at low water, but its true residence is in the laminarian zone, where it is frequent, mostly on the under surface of stones, and about the roots of *Laminariæ*, in from three to fifteen fathoms water. We have observed it in similar localities on both northernmost and southernmost coasts.

It is probably of northern origin, and ranges through the seas of Scandinavia, Greenland, and Boreal America, extending northwards on the American coast as far as the New York province. Middendorff includes it in his list of Russian Chitons. Its southern limits are uncertain.

### C. CINEREUS, Linnæus.

Variously coloured, oval, carinated, elevated, irregularly shagreened; margin very finely granulated.

Plate LVIII. fig. 1, as *C. marginatus* (enlarged).

*Chiton cinereus*, LINN. Syst. Nat. ed. 12, p. 1107 (from type).—MAT. and RACK. Trans. Linn. Soc. vol. viii. p. 22.—RACK. Dorset Cat. pl. 1, f. 4?—LOWE, Zoolog. Journ. vol. ii. p. 99.—CHEMN. Conch. Cab. vol. viii. p. 219, pl. 96, f. 818 (probably).—SPENGLER, Skriv. Nat. Selks. Kiobenhag. vol. iv. pt. 1, p. 98 (fide Lovèn).—WOOD, General Conch. p. 21, pl. 3, f. 4 (probably).

„ *marginatus*, PENN. Brit. Zool. ed. 4, vol. iv. p. 71, pl. 36, f. 2?—MONT. Test. Brit. p. 1.—TURT. Conch. Diction. p. 33.—FLEMING, Brit. Anim. p. 289.—JOHNSTON, Berwick. Club, vol. ii. p. 38.—MACGILLIV. Moll. Aberd. p. 184.—Brit. Marine Conch. p. 128.—BROWN, Illust. Conch. G. B. p. 66.—WOOD, General Conch. p. 21, pl. 3, f. 4 (probably).—MAWE, Linn. Conch. pl. 1, f. 2.—SOWERBY, Conch. Ill. Chiton, spec. 3, f. 106 to 111.—DESH. Lam. Anim. s. Vert. vol. vii. p. 505 (in part)?—GOULD, Invert. Massach. p. 147 (probably; not figure); copied by DEKAY, New York Fauna, Moll. p. 164.—LOVÈN, Ind. Moll. Scand. p. 28.—REEVE, Conch. Icon. vol. iv. Chiton, pl. 27, f. 182, 183.

„ *fuscatus*, BROWN, Illust. Conch. G. B. p. 66, pl. 21, f. 17.—MACGILLIV. Moll. Aberd. p. 185.

The *Chitons* of the earlier British writers, as well as those of the continental conchologists of the last century, are almost impossible to be determined with positive certainty, since it was not until comparatively of late years, that the requisite minute observation was bestowed upon the sculpture of their valves. Lowe was the first to devote his attention to this point in our indigenous species; and Fleming having received from Montagu the types of those described in the "Testacea Britannica" has enabled us to identify the clearly defined shells of Lowe with the previous obscure ones of our native authors. As in the present case it is absolutely impossible to say what Pennant intended by his *Chiton marginatus*, we have decided upon using the prior name of *cinereus*, although Linnæus has so inadequately defined his species, that, despite our certainty, from actual inspection of his cabinet, we should otherwise have avoided using that appellation. Moreover, the essential characters were not clearly indicated until its publication by Mr. Lowe as *C. cinereus.*

This is the commonest of our British *Chitons*, and by far the most variable in diversities of colouring. It is of a somewhat produced ovate shape, moderately elevated, subcarinated, or rather subangulated above, and with the outer edge of each valve mucronated or slightly beaked in the middle, and but moderately incurved laterally. Olive is, perhaps, the most prevalent tint, but no stress can be laid upon colour in this species, since some are orange, some nearly white with patches of a chocolate hue, some crimson red with white markings, some flesh colour with one or two of the valves of a madder-lake, &c.; many of the greenish varieties are waved with faint brown lines, or speckled with paler dots, and the dorsal ridge is not unfrequently pallid, or else painted on either side with a paler stripe: the margin is frequently, but not invariably, banded or spotted with whitish, opposite the sutures of the valves. The lateral areas are only indicated, for the most part, by their superior elevation, and are not defined by any marginal line or peculiarity of sculpture, for the entire exterior is most closely shagreened by small (often minute) depressed elongated granules, which do not exhibit either a radiating or longitudinal arrangement, but are approximately and somewhat concentrically disposed.

and of nearly equal size throughout. The ligament is rather narrow, and arenaceous or minutely farinaceous.

Mr. Lowe has remarked, that the margin of insertion in the separated valves exhibits two nearly equal teeth on each side upon the middle plates, twelve upon the last, and about ten upon the first. These characters may prove useful as subsidiary aids in the identification of the species.

The red variety, which, as far as our own experience goes, is usually the inhabitant of deeper water than the greenish or olivaceous type, which latter is very abundant under smooth stones, near low-water-mark, upon most parts of the English coast, displays a coarser and more prominent sculpture upon its valves, and larger granules upon its ligamental margin.

The monstrosity *C. quinquevalvis* (BROWN, Ill. Conch. G. B. p. 66, pl. 21, f. 22) probably belongs to this species.

The soft parts of the animal are of a general dusky flesh colour, except the centre of the foot, which is deeply tinged with livid blue. The under-margins of the mantle are of a pale flesh colour. The hood or veil of the head is narrow. There are from fifteen to eighteen branchial leaflets on each side, all of a dusky flesh colour. Each range of branchiæ extends from behind forwards rather more than two-thirds of the length of the body. The lingual ribband is slightly shorter than the length of the body, but rather wide, and in a middle-sized specimen we counted eighty transverse rows of lingual teeth, which for the greater part of its length are tinged with bright yellow. The axile denticle is linear, slightly widened at its extremity, and colourless, and resembles that delineated by Lovèn in his representation of the teeth of *asellus*.

This very common species is distributed all round our shores wherever there are loose and rather smooth stones between tide marks. It is scarcely ever found ranging beyond the laminarian zone at farthest. It appears to be of northern origin, ranging throughout the Scandinavian seas: and apparently extending to the coasts of Boreal America. Its most southern habitat recorded is Vigo Bay in Gallicia, where it has been taken by Mr. MacAndrew. It is not included in Middendorff's list of Russian Chitons.

### C. ALBUS, Linnæus?

Resembling *marginatus*, but with the dorsal granules excessively minute and crowded, and the marginal ones large and squamular.

Plate LXII. fig. 2.

*Chiton albus*, LINN. Syst. Nat. ed. 12, p. 1107 (probably).—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 22 (from last), pl. 1, f. 4 (uncertain). — LOWE, Zoolog. Journ. vol. iii. p. 80. — FLEMING, Brit. Animals, p. 290.—Brit. Marine Conch. p. 129.—BROWN, Illust. Conch. G. B. p. 66, pl. 21, f. 2?—O. FABRIC. Fauna Groenland. p. 422. — CHEMN. Conch. Cab. vol. viii. p. 290, pl. 96, f. 317 (badly). — SOWERBY, Conch. Ill. Chiton, f. 99, 100. — GOULD, Invert. Massach. p. 150, f. 21.—LOVÈN, Index Moll. Skandin. p. 27.—MIDDENDORFF, Malacozool. Rossica, pt. 1, p. 120.

" *aselloides*, LOWE, Zoolog. Journ. vol. ii. p. 103, pl. 5, f. 5.—Annals Philos. 1825, p. 387.—BROWN, Illust. Conch. G. B. p. 66.

" *sagrinatus*, COUTHOUY, Boston Journ. Nat. Hist. vol. ii. p. 82.

The characters of this species are by no means striking, and the shell, without careful attention, may be confused with *marginatus*, from which the greater coarseness of the ligamental scales, in proportion to the granules of the testaceous plates, affords the readiest mark of distinction. It is small, oval-oblong, rather elevated, more or less angulated dorsally, and of an uniform white or yellowish white, but often crusted wholly or partially with a black coating; whence, probably, the idea of its occasionally sombre hue has arisen, since none of the specimens examined by ourselves could be termed (as the species has been) of a blackish or chocolate colour. The valves are rather narrow across, the length of the exposed portion being, for the most part, as one to five or six; their lateral areas are not well defined, but are distinguishable by being rather more swollen, and generally of a more opaque yellow than the central ones. The curvature of the hinder edge of the plates is not considerable, and the beaks are so short, as sometimes to appear obsolete; the mucro of the last valve is not at all acute, and the posterior descent from it is gentle and arcuated. The sculpture is so very minute as not to be distinctly perceptible except under a powerful glass; to the naked eye, indeed, the surface appears glabrous. When very highly magnified, however, a remarkably crowded, but depressed, shagreening is observable, that, without positively being irregular, is neither radiating nor transverse, but from its peculiar closeness seems to occupy alike the entire superficies. Nevertheless there is a kind of diverging arrangement of meandering fissure-like lines near the beaks, where the valves appear rather scratched and punctured, than granulated; and the quincuncial system is approached upon the lateral areas. The ligamental border is only moderately broad, and is adorned with large white vitreous and almost level scales.

Mr. Lowe remarks that the terminal valves have eleven or twelve adhesional teeth, and the other plates two only on each side.

Few British specimens exceed a quarter of an inch in length, and about half that breadth: foreign examples are said to attain to twice these dimensions.

Middendorff describes the branchiæ of *C. albus* as not extending beyond the centre of the foot, and as being about twenty in number on each side.

This species has possibly been confounded with its near allies on some parts of the coast, so that it is difficult to ascertain its true range. Authentic specimens are all from the North; among the Hebrides (Lowe, Jeffreys, Barlee); in the Orkneys (Thomas); Lerwick and Scalloway, Zetland, in ten to twenty fathoms (Jeffreys); and on the north coast of Ireland (W. Thompson); there is reason to believe that it is not a common *Chiton*. It appears to be generally distributed through the Boreal and Arctic Seas.

### C. ASELLUS, Chemnitz.

Depressed, rather broad, subcarinated, generally ash-coloured; granulations of the central areas disposed in longitudinal moniliform rows.

Plate LIX. fig. 1, 2, and (Animal) Plate AA, fig. 5.

*Chiton asellus*, CHEMN. Conch. Cab. vol. viii. p. 290, pl. 96, f. 816 (fide Lovèn). —LOWE, Zoolog. Journ. vol. ii. p. 101, pl. 5, f. 3, 4.—BROWN, Illust. Conch. G. B. p. 66, pl. 21, f. 19.—SPENGL. Skriv. Nat. Selsk. Kiobenh. vol. iv. pt. 1, p. 99 (fide Lovèn).—DESH. Lam. Anim. s. Vert. vol. vii. p. 506. — MIDDEND. Malac. Rossic. Chiton, p. 122.

„ *minimus*, CHEMN. Conch. Cab. vol. viii. p. 289, pl. 96, f. 814 (fide Lovèn), from which WOOD, Gen. Conch. p. 19, and DILLW. Recent Shells, vol. i. p. 10.

„ *cinereus*, MONT. Test. Brit. p. 3.—TURT. Conch. Diction. p. 34.—FLEMING, Brit. Anim. p. 289.—FORBES, Malac. Monens. p. 37, animal, —JOHNSTON, Berwick. Club, vol. ii. p. 38.—Brit. Marine Conch. p. 128.—MACG. Moll. Aberd. p. 184.—DILLW. Recent Shells, vol. i. p. 12 (in part).—SOWERBY, Conch. Ill. Chiton, sp. 4, f. 95 to 98. — GOULD, Invert. Massach. f. 22? — REEVE, Conch. Icon. vol. iv. Chiton, pl. 28, f. 191. — LOVÈN, Index Moll. Scand. p. 27.

„ *albus*, MATON and RACK. Trans. Linn. Soc. vol. viii. pl. 1, f. 4 (probably).

Owing to the great confusion which has taken place between this species and the traditional *marginatus*, as well as the circumstance (proved by the Linnæan cabinet) that this was not the shell originally described as *C. cinereus*, we have retained the name attributed to the species by Mr. Lowe, who first clearly defined it, although the *asellus* of Chemnitz is nearly as obscurely indicated as the *cinereus* of Linnæus.

The shape of this *Chiton* ranges from oval to ovate elliptic, and the height from rather depressed to decidedly elevated: in the latter case the dorsal ridge, which typically is very obtusely subangular, is much more sharply angulated. The plates, which are short in proportion to their width, have their posterior curvature almost uninterrupted by any central rostration, the summit of the valves not differing from the general surface in either colour, sculpture, or elevation of area. The valves, towards their bases, are concentrically grooved with rather profound sulci of increase, and are divided into lateral and central triangles rather by the style and disposition of the shagreening than by any superior tumidity or line of demarcation on either. The raised granules upon the central areas are arranged in very numerous longitudinal moniliform or beaded series, which are for the most part nearer to each other on the more elevated portion of the valves than at the sides; the granules upon the lateral triangles, as well as those of the anterior plate, have a somewhat radiating disposition, are very close-set, and become coarser and less regular towards the ligament. This last is roughly arenaceous and narrow, the margin on each side taken together rarely exceeding, even if it equal, one quarter the breadth of the plates.

The general colouring is sallow, fulvous, or cinereous, often mottled or irregularly speckled upon the ligament with smoke-black, and not unfrequently painted with longitudinal linear markings of the same hue upon the central areas. In certain examples, and especially in those from Scotland, the surface is wholly or partially concealed by a black incrustation; frequently, too, a slight coating of this substance imparts a band-like effect to the posterior half of each plate; and sometimes probably this tint may be regarded as the permanent colour of the shell, although in the majority of specimens it is plainly superficial. In the more elevated variety, the lateral triangles are more raised, and the mucro of the hinder valve is more sharply prominent.

Mr. Lowe remarks that the plates are destitute of marginal teeth, but have their inner edges crenulated or granular. Although several of our specimens exceed half an inch in length and one third of an inch in breadth, we regard these dimensions as the full average.

The soft parts of the animal are of a somewhat tawny flesh-colour. The hood of the head is rather thick margined. The branchial cordons are rather broad, and do not extend on each side to half the length of the body. There are about ten branchial leaflets on each side. The space between the foot and the corner edges of the mantle on each side is rather broad. The lingual dentition has been described and figured by Lovén; the axile denticle is widened out at the base, and remarkably contracted and narrow in the centre; the large uncinated black tipped lateral teeth are very unequally denticulated at their inward extremities.

This species is as common and abundant below the laminarian zone as *cinereus* is above; perhaps even more so, for we can scarcely dredge anywhere on our coasts without taking it adhering usually to dead or living shells.

It is found ranging to far distances from land, and to greater depths than any other of our *Chitons*, having been taken in forty, fifty, eighty, and even one hundred fathoms around the Zetlands. It is occasionally met with at very low water, and is abundant in from four to thirty fathoms. It ranges from the Scandinavian seas to the northern shores of Spain.

### C. CANCELLATUS, Sowerby.

Resembling *asellus*, but much narrower; the back more elevated, quite rounded, not at all beaked.

Plate LIX. fig. 3.

? *Chiton albus*, PULTENEY, Hutchins, Hist. Dorset, p. 25. — RACKETT, Dorset Catalog. p. 25, pl. 1, f. 3.
„ *cancellatus*, LEACH ? SOWERBY, Conch. Illust. Chiton, spec. 5, f. 104, 105. —REEVE, Conch. Icon. vol. iv. Chiton, pl. 23, f. 152.

The supposed *Chiton cancellatus* of Leach,—for the species was never characterised by that naturalist, and Mr. Sowerby doubtingly gives him the reputation of founding it, solely from the traditionary authority of collectors,—approaches so closely to *C. asellus*, that Middendorff, whose elaborate work on the Russian Chitons exhibits remarkable powers of observation, has held it to be a mere variety. Since, however, it differs in very many points, we have held it advisable to retain it for the present, but propose merely to enumerate those characters which seem more strikingly to separate it from the shell we have compared it to. All the specimens we have seen are of a squalid, but uniform, whitish tint throughout, and are far smaller, much narrower (the length being twice the breadth), and proportionately more elevated than those of *asellus*. The back is peculiarly rounded, and the valves are not at all beaked.

The granules of the lateral triangles, whose shagreening is occasionally almost obsolete, scarcely display any radiating arrangement; the longitudinal ones of the central areas are rather oblique, and somewhat rhomboidal in shape; the series are so closely disposed that the punctured interstices are more conspicuous than the raised sculpture, from the grains being comparatively large, flat, and touching, so as almost to present a level surface. When highly magnified, the somewhat oblique longitudinal interstices appear to be decussated, lattice or diamond fashion, by still finer striulæ, whence probably the name *cancellatus* has been derived.

Our largest examples are not a quarter of an inch in length, and hardly exceed an eighth of an inch in breadth.

The *C. alveolus* of Sars, judging from Lovèn's description (Ind. Moll. Scand. p. 27), must bear some resemblance to this species, and Payraudeau's figure of his *C. Rissoi* (Moll. Corse, p. 87, pl. 3, f. 4, 5) reminds one not a little of its form and sculpture.

In about eight to ten fathoms, St. Peter's Port, Guernsey; Weymouth and South Devon (S. H.) In fifteen fathoms off Douglas Bay, Isle of Man (E. F.); Oban, fifteen fathoms; in fifteen to twenty fathoms near land, Zetland; and in forty fathoms in a tideway off Fitful Head (M'Andrew and E. F.); Loch Carron and adjacent lochs, in ten to twenty fathoms (Jeffreys).

### C. LÆVIS, Pennant (?).

Much elevated, narrow, red; ligament reticulated.

Plate LVIII. fig. 3.

*Chiton lævis*, PENNANT, Brit. Zool. ed. 4, vol. iv. p. 72, pl. 36, f. 3 (probably).— MONT. Test. Brit. p. 2. — MATON and RACK. Trans. Linn. Soc.

vol. viii. p. 21.—TURT. Conch. Diction. p. 33.—LOWE, Zoolog. Journ. vol. ii. p. 97, pl. 5, f. 1.—FLEMING, Brit. Animals, p. 290.—Brit. Marine Conch. p. 129.—WOOD, General Conch. p. 22.—SOWERBY, Conch. Illust. Chiton, species 7, f. 101, 102.—PHILIPPI, Moll. Sicil. vol. i. p. 107, pl. 7, f. 4; vol. ii. p. 83.—REEVE, Conch. Icon. vol. iv. Chiton, pl. 26, f. 125.

*Chiton marginatus*, PULTENEY, Hutchins, Hist. Dorset, p. 25 (probably).—MATON and RACK. Trans. Linn. Soc. vol. viii. pl. 1, f. 2.—RACKETT, Dorset Catalog. p. 25, pl. 1, f. 2 (probably).—LAM. Anim. s. Vert. (ed. Desh.) vol. vi. p. 492 (in part only).

„ *achatinus*, BROWN, Illust. Conch. G. B. p. 65, pl. 21, f. 4, 12, 13, 15.

„ *corallinus*, RISSO! H. N. Europe Mér. vol. iv. p. 268 (fide Philippi).—LOVÈN, Index Moll. Scandinav. p. 28.

Considerable doubt exists as to this being the species actually intended by Pennant under the epithet *lævis*, but as an unbroken chain of traditional authority has sanctioned the identification, and his brief diagnosis and wretched figure will not agree better with any other British *Chiton*, we have, although with some hesitation, attributed to that author the merit of having founded the species. Its peculiar margin enables even the most casual observer to distinguish it at a glance from its native congeners.

The shape ranges from oval to produced elliptical, and the shell is much, and rather suddenly, elevated dorsally, assuming in the more typical and laterally compressed examples a more angular appearance, from the plates being more or less flattened (instead of convex) at the sides. The middle portion of the posterior or externally visible edge of the valves is, in the young, decidedly beaked, in the middle-aged specimens but slightly so, whilst, in aged individuals, owing to the frequent dorsal erosion at that stage of growth, this mucronation becomes obscure or obsolete; the lateral portions have a tendency to slope backwards. The general colouring is red or rufous brown (the smaller the specimen the more vivid, for the most part, is the tint), either uniform, or variegated with a marbling of white or green on a ground which is more dusky in the large northern examples, than in the smaller but more elegant southern ones. The surface of the plates, which are comparatively long considering their narrowness, is a little shining, and to the eye apparently smooth; a powerful lens reveals an extremely minute depressed kind of obscure and irregular shagreening. The division of areas is only, if at all, indicated by the sudden elevation of surface at the commencement of the lateral triangles; the concentric lines of growth are not unfrequently a little prominent. The declivity at the termination of the posterior mucro is not abrupt. The connecting or ligamental border is remarkably broad, that on each side of the fifth plate occupying together from two-sevenths to (in the young chiefly) even two-fifths of the entire width. It is a little glossy, very closely reticulated in diamonds, and if not displaying the mottled painting of the testaceous plates, is often curiously marked on its red ground with two pair of conspicuous white spots, situated in a line with the sutures of the terminal plates at either extremity.

Mr. Lowe observes that there are twenty small insertional teeth on the first plate, and four, of which the first is larger than the rest, upon each side of the middle valves. He remarks, likewise, that the *C. septemvalvis* of Montagu (Test. Brit. p. 3.—*C. discors*, Maton and Rack. Trans. Linn. Soc. vol. viii. p. 20.—Brown, Ill. Conch. G. B. p. 67) belongs to the present species rather than to the *marginatus* of authors, its margin being described as reticulated. One of our larger examples measures half an inch in breadth, and fully eleven lines in length.

We have, unfortunately, no note of the soft parts of the animal.

This is a scarce species, never occurring gregariously. It ranges in from low-water-mark to forty fathoms water, but is chiefly an inhabitant of the coralline zone. It appears to be present in all our marine provinces. Among localities, may be cited Torquay and Weymouth (S. H.); Exmouth and bays near Swansea (Jeffreys); fifteen to eighteen fathoms off Douglas Head, and elsewhere on the coast, off the Isle of Man (E. F.); in seven to twenty-seven fathoms off Lundy Island (M'Andrew); twelve fathoms Orkney, and fifteen to twenty fathoms Zetland (M'Andrew); in forty fathoms off the Mull of Cantire (Hyndman); Oban and Loch Long (Barlee); "on both sides of Ireland, but very rare" (Thompson).

It ranges from Norway to the Mediterranean.

## C. MARMOREUS, O. Fabricius.

Valves broad, most minutely shagreened; ligamental margin coriaceous.

Plate LVIII. fig. 2, and Plate LIX. fig. 4.

*Chiton marmoreus*, O. FABRIC. Fauna Grœnlandica, p. 420. — MIDDENDORFF, Beit. Malacozool. Rossic. (Mem. Sc. Nat. Petersburg, vol. vi.) p. 103.

„ *ex rubro et albo marmoratus*, CHEMNITZ, Conch. Cab. vol. viii. p. 287, pl. 96, f. 812 (badly).

„ *ruber*, SPENGLER (not Linn.), Skriv. Nat. Selks. Kiobenhag. vol. iv. pt. 1, p. 92 (fide Lovèn).—LOVÈN, Index Moll. Scand. p. 28.

„ *lævigatus*, FLEMING (not Sowerby), Edinb. Encyclop. p. 113; Brit. Animals, p. 290.—Brit. Mar. Conch. p. 129.—BROWN, Ill. Conch. G. B. p. 67, pl. 21, f. 1, 16. — REEVE, Conch. Icon. vol. iv. pl. 27, f. 179.

„ *latus*, LOWE, Zoolog. Journ. vol. ii. p. 103, pl. 5, f. 6, 7. — SOWERBY, Conch. Ill. Chiton, spec. 9, f. 113.

„ *fulminatus*, COUTHOUY, Boston Jl. of Nat. Hist. vol. ii. p. 80, pl. 3, f. 19.

—Gould, Invert. Massachus. p. 148, f. 23. (probably).—
Dekay, New York Fauna, Moll. p. 165, pl. 10, f. 99 (probably).

*Chiton pictus*, Bean, Brit. Marine Conch. p. 264, f. 56.

Otho Fabricius, who appears to have been the first who directed his attention to the insertional teeth in the valves of *Chiton*, has described this *Chiton* in his Fauna of Greenland, a work which, considering the carefulness and sufficiency of his descriptions, contrasting strongly with the loose, curt, and indefinite language of most of the subsequent writers upon Conchology, has been singularly neglected by our writers upon shells.

The shape of this *Chiton*, our largest British species, is ovato-elliptic, the form being rather broader in front than behind, where also the shell, which is moderately elevated, becomes rather more depressed, and the dorsal angulation, which even anteriorly is more or less obtuse, becomes almost or wholly obsolete in the larger examples. The plates or valves are rather glossy, and apparently smooth, but when magnified exhibit an extremely minute shagreening, wherein the granules, which, although remarkably numerous, cannot be termed crowded considering their size, seem all of the same dimensions, and are not disposed in any peculiar arrangement upon the several areas; the lines of increase are tolerably distinct. The lateral triangles are indicated by their slight superior elevation either wholly or anteriorly; in the latter case there is occasionally an indistinct radiating approximate sulcus, or the central portion is hollowed out, so that the hinder edge seems slightly raised likewise. The posterior dorsal edge is a little incurved laterally, and rather abruptly beaked in the centre; the mucro is short, and not distinguished from the rest of the surface by either colour, substance, sculpture, or elevation. The hinder valve is both short and narrow; it is slightly and indistinctly submarginated at its extremity. The connecting ligamental margin is coriaceous, very narrow in the young (where the thin edge contracts extremely in drying), and but moderately broad, in proportion to the wideness of the plates, in the adult, the two edges together averaging, at the fifth valve, even in the large Scotch examples, only about two-sevenths of the breadth of that plate. The colouring consists of linear zigzag markings, flammules, or angular spots of white, greenish, or flesh-colour, upon a ground of rufous or Turkey red, with the posterior edge often prettily articulated with darker tinted and white spots, or *vice versâ*, the pale colours preponderating; the leathery margin is either of an uniform fulvous brown, or barred with dusky olive upon a tawny ground. Mr. Lowe states that the first plate is furnished with nine broad teeth, the last with eight broad ones; the intermediate valves with two on each side. The *lævigatus* of Macgillivray (Moll. Aberd. p. 185), with a granulated border, is evidently not the species so named, but possibly a young *asellus*. Scotch specimens are occasionally found seventeen lines broad and eleven long, and sometimes even of still larger dimensions; English individuals are much smaller.

The animal, according to Middendorff, has its range of branchial leaflets extended to half the entire length. There are about twenty-four on each side, placed rather distant from each other.

This is one of our rarer and more local *Chitons* as well as the finest species we possess of the genus. It is essentially a northern form. In the north-east of England it has been taken at Scarborough (Bean); among rocks below Dunstanborough Castle, very rare (Embleton); a single living example at Cullercoats (A. Hancock); disunited valves on Whitley Sands (Fryer); rare on the Black Rocks, Leith, Frith of Forth (Knapp); Gair Loch and Firth of Clyde (Smith); Skye at low-water, and elsewhere in the Hebrides (E. F.); plentiful in seven fathoms at Lerwick, Zetland (E. F.); "rare, but found on the north, east, and west coasts of Ireland;" in fourteen fathoms Strangford Loch (W. Thompson).

It ranges throughout the Scandinavian and Arctic Seas, and along the coasts of Boreal America.*

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* In Turton's "Conchological Dictionary of the British Islands," (p. 34,) a *Chiton punctatus* is thus described: "Shell with eight valves, raised, beaked, and margined, very convex, deep red, finely and distinctly punctured all over." To this brief and most imperfect diagnosis is added the remark, that these punctures seem the sole distinguishing feature between it and *lævis*, and that it is a quarter of an inch long. The very rude delineation (fig. 10) which accompanies the text, bears some slight resemblance to *marmoreus;* the language is more applicable to an eroded *lævis*. The specimen itself, found by Mr. O. Kelly at Portmarnock, in Ireland, will probably be transmitted to us before the conclusion of the "British Mollusca."

# PATELLIDÆ.

It would seem to be a law in both animal and vegetable kingdoms that no character, whether of structure or form, preserves an equal value in every tribe, but varies in its importance; in one group characterising a class, in another scarcely determining a species. Important as the arrangements of the respiratory system are among the *Mollusca*, we have an example in the family before us of their degradation to a mere generic value. Cuvier associated the Chitons and Limpets in one order distinguished from all other sections of the Gasteropods by the disposition of the branchial leaflets, yet no malacologist who attends closely to the conformation of the soft parts in *Chiton* and *Patella*, would hesitate, in the present state of our knowledge, to maintain that the latter genus had more affinity with *Acmæa* and its allies, than with the former, however different the branchial arrangements appear. The difference is more in appearance than in reality; and the resemblance between the branchial arrangement of *Chiton* and *Patella*, in like manner, is more apparent than real, although Cuvier mistook it for an indication of affinity. The cyclobranchiate gill of *Patella* seems to us a single long branchial plume, exserted from the cervical cavity, and coiled round between mantle and foot. Without going so far as Professor Lovèn, who has united the entire shelled patelliform Mollusks in one genus, we feel bound on anatomical and physiological grounds, to associate them in one family, and in doing so feel at the same time, that, without making any scientific sacrifice, we are relieving the conchologist of what seemed to him one of the most anomalous and unnatural disunions of similar shells, which the naturalist, through overvaluing the characters presented by the respiratory organs in the Limpet tribe, had proposed. Between the genera themselves, however, it is very difficult to distinguish by shell alone.

The animals of the *Patella* tribe have distinct heads furnished with two distinct tentacles, which are in some genera provided with eyes towards their external bases, in others are eyeless. They have a very large and powerful creeping disk, between the sides of which and the mantle are seen, in some genera, the branchiæ forming a cordon of fine lamellæ; in others these organs are grouped into a distinct plume, and lodged in a cervical cavity. The sides of the foot are never ornamented with cirrhi, but the margin of the mantle is sometimes cirrhated, sometimes entire. The mouth is armed with a pair of corneous jaws, between which we find the extremity of a very long ribband-like tongue, bearing a powerful armature of denticles. The arrangement of the denticles is constant in each genus. The shell is conical and cup-shaped: it is entire, and its apex is usually turned towards the head of the animal, in one genus from it. On the inner surface of the shell are seen the muscular impressions from which the position of the head of the animal may be known when the soft parts are removed.

## PATELLA, Linnæus.

Shell ovate, or nearly round, conical, with a subcentral anteal apex, surface smooth, or with radiating striæ or ribs; interior with a crescentic muscular impression, interrupted in the region of the animal's head.

Animal with two subulate tentacles, bearing eyes on the outer sides of their swollen bases; mantle-margin fringed; branchial plume forming a fixed cordon of minute close-set plates, placed between the mantle and base of foot, and ranging nearly round the body; foot a large, ovate, or round disk, with plain sides. Buccal mass with cartilaginous jaws; lingual ribband very long, armed with transverse ranges of teeth, of which six in each series belong to the rachis, flanked on each side by three accessorials.

The Limpets, properly so called, few as the species are upon our shores, though none of our Gasteropods are so prolific individually, may be grouped under two sections, to which the names Patella and Patina were respectively applied by Dr. Leach, who appears to have regarded them as distinct genera, probably more from love of excessive analysis of species than from knowledge of their true differences, since, so far as we are aware, the distinguishing characters have not been noted. In the rock Limpets (Patella, as *P. vulgata*, and *P. athletica*), the branchial cordon extends very nearly round the body, being unsymmetrically interrupted on one side near the neck, and the mouth is emarginated below; in the seaweed Limpets (Patina, as *pellucida*), on the other hand, the branchial cordon is interrupted for a considerable space in front of the head, and terminates nearly symmetrically on each side of the neck; the mouth, too, is entire below. Before recognising these distinctions as of generic value, it is desirable to ascertain whether they be constant in exotic forms of the two groups, both of which have representatives in almost all the seas of the globe.

### P. VULGATA, Linnæus.

Substance greyish, olivaceous or yellowish, never white; ribs not armed with a regular series of tooth-like scales: spatula opaque white.

Plate LXI. fig. 5. 6.

LISTER, An. Angl. pl. 5, f. 40.—KNORR, Délices des Yeux, pt. 6, pl. 27, f. 8.

*Patella vulgata*, LINNÆUS, Syst. Nat. ed. 12, p. 1258.—PENN. Brit. Zool. ed. 4, vol. iv. p. 142, pl. 89, f. 145. — PULTENEY, Hutchins, Hist. Dorset, p. 51. — DONOV. Brit. Shells, vol. i. pl. 14. — MONT. Test. Brit. vol. ii. p. 475, conical var. — MATON and RACK. Trans. Lin. Soc. vol. viii. p. 229, part.—RACK. Dorset Catal. p. 58, in part, pl. 23, f. 1, 2, 8.—TURT. Conch. Diction. p. 135, in part. — FLEMING, Brit. Anim. p. 286. — FORBES, Malac. Monens. p. 36, var. *a*.—JOHNSTON, Berwick. Club, vol. ii. p. 35, in part.—MACG. Moll. Aberd. p. 180.—Brit. Marine Conch. p. 130, chiefly.—BROWN, Ill. Conch. G. B. p. 63 (all but var. 3), pl. 20, f. 5, 15, 17. — BOSC, H. N. des Coquilles, vol. iii. pl. 25, f. 5, 6. — DILLW. Recent Shells, vol. ii. p. 1032 (not var.). — LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 535. — WOOD, Index Testac. pl. 37, f. 38.—BLAINV. Man. Malacol. pl. 48. f. 1.

„ *depressa*, PENN. (not Helbling), Brit. Zool. ed. 4, vol. iv. p. 142, pl. 89, f. 146.

*Common limpet*, HUMPHREYS and DA COS. Nat. Hist. Shells, pl. 2, f. 1. — Ann. N. H. vol. i. p. 482.

*Patella vulgaris*, DA COSTA, Elem. Conch. pl. 1, f. 1, 2, 8; Brit. Conch. p. 3, chiefly, pl. 1, f. 1, 2.

? *Die graue scharfegeribte Patelle*, KÄMMERER, Cab. Conch. Rudolst. (1786), p. 15, pl. 3, f. 6.

The Limpets are a peculiarly difficult tribe to divide into species, since they not only present but few tangible features for description, but those few are likewise susceptible of great modifications. The *P. vulgata* is not the least variable of its genus, and exhibits considerable variation in shape and colouring; which seems partly to depend upon growth, partly to result from local circumstances. Middle-aged specimens—generally the most characteristic stage in *Patella*,—of nearly an inch and a half long, are of a subovate figure, subconical, strong, and for the most part of a rather pale olive or dirty and somewhat olivaceous yellow cast; in the former case, obscurely marked with rather narrow rays of dark grey; in the latter, with the rays generally much interrupted, chiefly conspicuous in the more depressed portion of the surface, and often of a rich chocolate brown. In one of our varieties the darker rays are very obscure, and the small ribs are somewhat radiatingly speckled with white; in another the entire exterior, as well as the inner edge, is of a dark brown, and the interior, the spatula excepted, is of a very pale olive hue. The inside partakes of the external painting (the substance of the shell, and not merely the superficies, being coloured) but is somewhat paler, and is always slightly iridescent; the spatula-shaped central portion is of an uniform opaque and rather bluish white, and not edged with orange. The margin is less ragged than in the succeeding species, but is angularly undulated in the more strongly ribbed forms, almost plain (but never quite so, unless abraded) in the simply striated ones. These are the two principal varieties as to sculpture: in the more characteristic individuals of the former, and such are generally conical, there are about twenty-five strong and bluntly angulated unarmed ribs, each with about three or four interstitial striæ; in the latter the ribs are almost obsolete, or actually divided into irregular slightly raised simple striæ, with which the entire surface is densely covered.

Aged shells have usually a more rounded contour, and greater elevation; their obtuse vertices are rather more central than in the young. These last display a richer style of colouring than the more mature individuals, being not unfrequently of an orange red, with the inside beautifully iridescent and adorned with rays of a bright red; the spatula at that stage of growth is not yet developed. In some the ribs are roughened by nodulous projections, but these nodules are irregular, generally few in number, and not fang-shaped. Sometimes they are large and blunt (in which case the ribs are broad and strong); sometimes, too, there are crowded vaulted scales upon the costellæ, owing to the more than ordinary projection of the closely set concentric wrinkles, which, although delicate, are always more or less apparent upon the surface. These examples form the nearest approach to *athletica*, especially when the ribs are nearly white; and were it not for the different colour of the substance of the shell, might, at a stage when the whole of the distinctive features are not developed, be readily mistaken for that species.

Our larger examples measure twenty-eight lines in length, and twenty-three in breadth.

The animal is of a general bluish or dusky hue; its head is dusky with long, strong, conical tentacula, which are tinged towards their extremity with a bluish or dusky tint, and bear a small black eye on the outside of each of their swollen bases: when the creature is at rest it bears its tentacles contracted and appressed with their tips curled towards each other. The lips of the mouth are puckered, thickened above, and at the sides narrow, and as if emarginate below. The jaws are tinged with dusky. The very long tongue is armed with numerous transverse series of denticles; of these, four nearly similar narrow ones, with brown hooked even extremities, form the centre of the rachis, and two brown hooked lower-placed broader ones flank them, bounded by three colourless accessorials on each side. The length of the tongue exceeds that of the shell; in a limpet two inches and a half long it exceeded those dimensions by three-twelfths. On this tongue we counted one hundred and sixty transverse bands of teeth: as each band is composed of twelve denticles, there were no fewer than one thousand nine hundred and twenty teeth in all: twenty-two of the transverse bands belonged to the winged part of the tongue. The foot is either entirely of a smoky hue, or tinged with dusky yellow on the disk, and bluish on the base. The branchiæ form a nearly complete cordon of closely packed drab or yellowish plates, rounded at their margins; the series commences as if protruded from the cervical cavity on the left side of the head, and coiled backwards round the body to terminate, after gradually becoming smaller and smaller to its origin. The mantle is yellowish white, often tinged with dusky, and is fringed with fine filiform cirrhi, which, as Mr. Clark was first to observe, differ in their arrangement from those of the next species insomuch as they are arranged in three alternations of different lengths.

The common Limpet is universally distributed around our coasts, living on the surface of rocks and stones between tide-marks. Although capable of moving about with facility, when well-grown it appears to become lazy and sedentary, often living in crevices, where having once lodged it remains till it grows too large to come out. In such cases it certainly cannot subsist on fuci, as generally supposed, but must depend upon the waves for a supply of some other kind of food, possibly infusorial. When it moves about, it makes upon the rock a curious fucoid-like track of some breadth, probably caused by the edges of the shell. On calcareous rocks, and especially on chalk, it frequently, as it were, excavates a cavity for itself, apparently by the action of the carbonic acid set free during respiration, since the marks of the action of the ciliary currents from the gills are distinctly visible. This animal is sometimes used for food, though much too leathery to become a delicacy. As bait it is very valuable to fishermen. Dr. Johnston, in some very interesting notes on the Limpets of the Berwickshire coast,* calculates that in Berwick alone there is an annual consumption of no fewer than 11,880,000 Limpets for this purpose. "From constant warfare," he says, "the numbers have now greatly decreased; there is not now one out of ten that there were twenty years ago, and the collecting of them has become tedious enough." In the "Annals of Natural History" for June 1839, there is a very interesting paper by Mr. Patterson on the use of the Limpet as food in the north of Ireland. It is therein stated that the Limpet gatherers, thirty in number, at Larne in Antrim, earned in one season of four months, no less than one hundred pounds sterling.

The *Patella vulgata* ranges along the Atlantic shores of Europe.

### P. ATHLETICA, Bean.

Substance of the shell white; ribs very numerous, narrow, much elevated, armed with toothlike scales in a regular series, interstices wholly or partially stained with rich brown; inside more or less of a whitish cast, spatula tinged with orange-yellow.

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* Berwickshire Nat. Club Report for 1842.

Plate LXI. figs. 7, 8.

? *Patella vulgata*, Linn. Fauna Suecica, ed. 2, p. 534.
„ „ *depressed var.* Mont. Test. Brit. vol. ii. p. 476.
„ *aspera?* Philippi, Moll. Sicil. vol. i. p. 111; vol. ii. p. 84 (from specimens).
„ *vulgata, var. β.*, Forbes, Malac. Mon. p. 36.
„ „ *var.* 1, Johnston, Berwickshire Club, vol. ii. p. 36.
„ *athletica*, Bean, Brit. Marine Conch. p. 264, f. 108.—Alder, Cat. Moll. Northumb. and Durh. p. 71.
„ *vulgata, var. albumena*, Brown, Ill. Conch. G. B., p. 63, pl. 20, f. 12, 14.

In assenting to the separation of this shell from the preceding, we shall probably incur some animadversions. A long and peculiar study of the Limpets has, however, induced us to believe that the characters briefly enumerated in our diagnosis are of at least equal value to those by which *cærulea*, *Candei*, &c., are distinguished from *vulgata*.

Ordinarily this shell is rather depressed, yet it is not unfrequently subconical, although it never, we believe, attains to that elevation so customary in aged examples of the preceding species. In form, it ranges from rounded oval, passing through simply ovate, to elliptic, a shape which is far more habitual to it than to *vulgata*. The substance of the shell is thick, nearly opaque, and squalid white; externally the surface is more or less adorned with chestnut, reddish brown, or chocolate colour in the interstices of the costellæ, which latter are always white, though at times sparingly painted with brown likewise. In the more characteristic examples, the darker tint of the narrow interstitial spaces alternating with the pure white of the raised portion of the sculpture, presents a very beautiful and frequent radiation; very often, also, the colouring is disposed in interrupted concentric zones; sometimes, even, it is almost entirely absent. The interior, which is rarely at all nacreous, is either whitish, or of a pure orange-yellow, with which hue the spatula, in the more typical specimens, is more or less stained or bordered: the margin of the shell is often articulated with brown and white, and is greatly jagged or dentated, owing to the projection of the external costellæ. These last are extremely numerous, more or less sharply angulated, prominent considering their narrowness, and regularly, crowdedly, and finely muricated; they are sometimes simple, and of equal width to each other (in some individuals, chiefly foreign, there are as many as from 100 to 150, and all so closely set that the interstitial spaces are no broader than themselves); sometimes arranged in triplets, of which the central riblet is rather the largest. The vertex, as in *vulgata*, is rather blunt, and is less subcentral in the more elongated than in the broader examples.

None of our known British specimens are quite so large as certain of the preceding species, but we possess some (possibly exotic ones) that measure nearly two inches in length and about an inch and a half in width, which is twice the general size of those taken upon our coast.

Our belief in the propriety of keeping this Limpet distinct from *vulgata* is importantly supported by observations communicated to us by Mr. Clark, who, when not aware that the form had been regarded and named as a separate species, decided for himself that it was such, after an examination of the shells of several hundreds of both and a careful comparison of their animals. We have recently, with his notes in hand, carefully compared the soft parts of each species alive, and can fully verify the following account. Of *athletica* he remarks, that "the animal differs specifically from *vulgata*; its colour is invariably much lighter, and has the general substitution of the various shades of orange-yellow for the lead or pale smoke-brown of its congener. The mantle is edged with flaky-white jointed filaments of only two lengths, twice as short and twice as thick as those of *vulgata*. The branchial plates are in proportion longer, thinner, paler, and more round at the points. The foot is of various hues of orange-yellow, with scarcely any anastomosing lines,* and its margin is more fleshy. The head is of the palest purple; the tentacula are pale yellow, shorter, and more slender in proportion than in *vulgata*. This species has been long known on the Devon coast as the China Limpet, from the rich Chinaware-like hue of the inside of the shell; whereas its congener has a far commoner and poorer aspect. These characters of the two are undeviating. They inhabit different levels, the *vulgata* being always in the higher zone. The *athletica* is very partially distributed hereabouts, being only found about four miles from Exmouth, in a very small area of an acre or two, where it is tolerably plentiful and exceedingly beautiful; very few of the common species are found along with it." We have sought in vain for differences between the structure of the tongue in this and the common species.

The species is probably generally, though locally, distributed round our coasts. Captain Brown noticed it on the Northumberland coast in 1810, and Mr. Alder remarks that it is there rather rare, living on rocks close to low-water-mark, scarcely to be gathered but at spring tides. He adds that in some parts of England he has seen this Limpet range much higher up between tide-marks, and has noticed on the southern coast an intermediate form between this and *vulgata*, which looks very like a hybrid: "the fishermen recognise the difference between them, and call this the Horse-limpet, rejecting it as too tough for bait." This rejection of the animal as bait seems general; in the little island of Herm, near Guernsey, the two species are never found mixed; and poultry, which are there fed upon Limpets, turn from the *athletica*, whilst they greedily devour the common kind (S. H.). Dr. Johnston, in his interesting account of the Berwickshire Limpets, says that the fishermen distinguish these as "*Yawds*," and that they "have a tough leathery foot of a cream-yellow colour, and tentacula of the same colour, but a shade lighter. They are found near low-water-mark, and are said to be less common than the other varieties. They are almost worthless as baits." Lieut. Thomas informs us that the fishermen in the Orkneys make a distinction between the Limpets near high- and those near low-water-mark, and say that the fish will hardly take the first, when they will freely bite at the latter, which, if the low-water form be the species before us, is contrary to the usual observation.

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* Dr. Knapp, however, has sent us specimens of the China Limpet from both Guernsey and Jersey, with the note that the animal is "always black or dark-coloured," and on the Dorsetshire coast we find both dusky and yellow-footed individuals (E. F.).

### P. PELLUCIDA, Linnæus.

Not ribbed, smooth or nearly so, usually with radiating linear markings of blue or bluish green: margin quite entire.

Plate LXI. fig. 3, 4, and (Animal) Plate A.A., fig. 1.

LISTER, Hist. Conch. pl. 542, f. 26, 27.

*Patella pellucida*, LINN. Syst. Nat. ed. 12, p. 1260.—PENN. Brit. Zool. ed. 4, vol. iv. p. 143, pl. 90, f. 150.—PULTENEY, Hutchins, Hist. Dorset, p. 51.—DONOV. Brit. Shells, vol. i. pl. 3, f. 1.—MONT. Test. Brit. vol. ii. p. 477.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 233.—RACK. Dorset Catalog. p. 58, pl. 23, f. 5.—TURT. Conch. Diction. p. 137.—FLEMING, Brit. Anim. p. 286.—JOHNSTON, Berwick. Club, vol. ii. p. 37.—Macg. Moll. Aberd. p. 182.—Brit. Marine Conch. p. 131.—Brown, Ill. Conch. G. B. p. 64, pl. 20, f. 2, 3, 7, 8, 11.—Ström. Acta Nidros. vol. iv. (1768).—Müller, Zool. Dan. pl. 104, f. 1 to 4.—Born, Testac. Mus. Cæs. pl. 18, f. 9.—Chemn. Conch. Cab. vol. x. p. 330, pl. 168, f. 1620.—Dillw. Recent Shells, vol. ii. p. 1042.—Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 540.—Wood, Index Testac. pl. 37, f. 58.—Desh. Encyc. Méth. vol. iii. p. 710.—Sowerby, Man. Conch. f. 230.—Hanl. Conch. Book Spec. p. 6.

*Patella lævis*, Penn. Brit. Zool. ed. 4, vol. iv. p. 143, pl. 90, f. 151.—Turt. Conch. Diction. p. 137 (not var. bimaculata).—Flem. Brit. Anim. p. 286.—Johnston, Berwick. Club, vol. ii. p. 37.—Macg. Moll. Aberd. p. 182.—Dillw. Recent Shells, vol. ii. p. 1043 (not var.)

*Blue rayed limpet*, Humphreys and Da Cos. Nat. Hist. Shells, pl. 4, f. 4.

*Patella cæruleata*, Da Costa, Brit. Conch. p. 7, pl. 1, f. 5, 6.

„ *bimaculata* (young), Mont. Test. Brit. vol. ii. p. 482, pl. 13, f. 8.—Maton and Rack. Trans. Linn. Soc. vol. viii. p. 235.

„ *cærulea*, Mont. Test. Brit. Suppl. p. 153.—Flem. Edin. Encycl. pl. 204, f. 1.—Forbes, Malac. Monens. p. 36, animal.—Brown, Ill. Conch. G. B. p. 64, pl. 20, f. 13.—Wood, Index Test. pl. 37, fig. 59.

„ *elongata* and *elliptica*, Flem. Encyc. Edin. pl. 204, f. 2, 3.

„ *cornea*, Potiez and Mich. Gal. Douai, Moll. p. 525, pl. 37, f. 5, 6.

*Acmæa pellucida*, Brit. Marine Conch. p. xxxii.

The two varieties of this elegant Limpet differ so remarkably from each other, as strikingly to illustrate the effects of food and habitat upon colour and solidity. The more typical *pellucida* feeds upon the leaves of the *Fuci*, the aberrant *lævis* upon the roots and stalks, in which indeed it is wont to imbed itself. The former is thin, semitransparent, of a dark olive when adult, of an ochraceous yellow when young, is regular in shape, which ranges from subelliptic to rounded ovate—for, as in most Limpets, the shape tapers a little behind—and is adorned with more or less interrupted linear rays of lustrous Mazarine blue, that vary greatly both as to number and approximation. The latter form is a much stronger shell, very irregular in shape, yet generally pinched up, as it were, at the sides (so that when placed upon a level surface, the side margins alone touch it), of a yellow or ochraceous horn colour, with the blue rays often all but wholly obsolete, and almost invariably of a lighter tint. In both states the interior has a tendency to iridescence, and the exterior is nearly smooth, having merely some obsoletely raised but numerous radiating striæ, which for the most part are more conspicuous behind than in front, and some most minute and densely set concentric striulæ. In the more solid form, however, the internal opalescence is much more beautiful, and often exhibits a brilliant lilac or violet iridescence; and the external sculpture, besides being more pronounced, has the stages of increase not unfrequently strongly indicated. The margin is entire; the vertex obtuse, and much reclined.

The younger shells of the typical and undistorted form are much depressed; the adult are conical convex; the more elevated the specimens the less marginal does the vertex become. In *lævis* the dusky subinternal spot, which almost always lies beneath the vertex of the shell, is usually smaller, and is often nearly wholly absent. In the typical *pellucida* a short central linear ray of the same hue not unfrequently precedes this stain. We possess specimens nearly an inch long, but the average size of examples does not exceed two-thirds of that measurement.

The animals of the two varieties are exactly alike in all essential characters, varying only in colour. We find that of *lævis* usually white or yellowish; that of a well-grown *pellucida*, as taken in the Hebrides, usually orange. The comparatively greater exposure to light of the latter form may account for this difference. Mr. Clark has examined a very large series of the animal in all stages of growth, from the *pellucida*, only a one-twentieth to a quarter of an inch in length, and from thence to *P. lævis*, of three-quarters of an inch long, and finds the organs similar in all respects, with a slight variation of colour dependent on age.

The mantle is often bordered by a grey line, and is fringed with numerous ("fifty to sixty-five," according to Mr. Clark) fine cirrhi which vary in length in different individuals. The branchiæ form a fringe of minute white plates between the foot and mantle, interrupted in front of the head, and terminated on each side nearly symmetrically. In a specimen three-fourths of an inch long we counted about a hundred branchial plates; the hinder ones were longest. The head is rather large, terminating inferiorly in a short proboscis, which has puckered edges, but is not emarginated below; the tentacula are rather short, obtuse, and linear; they bear minute eyes on the outer sides of their slightly swollen bases. "The foot is oval, very thick and dense, and the viscera are pale coloured; the stomach from the pylorus gives forth a very long intestine, greatly convoluted between the lobes of the liver, which is light green (sometimes pale yellow, E. F.), and near the posterior end doubles and terminates as a rectum, accompanied by the oviduct a little to the right of the centre of the neck, under the right tentacle, not at the side of the body; the vent is double the size of the oviduct, which progresses from the oval, pale red brown minutely granular mass of the ovarium, placed immediately above the foot, at the posterior end" (Clark MSS.). The lingual ribband is not so long as in *P. vulgata*; it is less than the length of the body; in a specimen nine-twelfths of an inch long, it measured seven-twelfths, and we counted eighty transverse series of teeth. Its axis is formed of four nearly equal teeth, with parallel sides, and hooked brown anterior terminations; at each side of each series is a broad brown tooth, tricuspid at its inner summit; outside of it is the first lateral, very broad, square, and colourless; several colourless laterals follow. The jaws are tinged with dusky.

This Limpet is found all round our coasts, wherever *Laminariæ* grow. It ranges northwards to the Norwegian seas, and southwards to the shores of Gallicia.

### SPURIOUS.

### P. INTORTA, Donovan.

*Patella pectinata*, BORN (not Linnæus), Test. Mus. Cæs. p. 423, pl. 18, f. 7.—LAM. Anim. s. Vert. (ed. Desh.), vol. vii. p. 539.—BLAINV. Man. Malac. pl. 49, f. 5.—DESH. Encycl. Méthod. vol. iii. p. 710.—POTIEZ and MICHAUD, Gal. Douai, Moll. vol. i. pl. 37, f. 11, 12.

„ *intorta*, PENN. Brit. Zool. ed. 4, vol. iv. p. 143, pl. 90, f. 148?—DONOV. Brit. Shells, vol. v. pl. 146.—MATON and RACK, Trans. Linn. Soc. vol. viii. p. 231.—MONT. Test. Brit. Suppl. p. 154.—TURT. Conch. Diction. p. 136.—FLEMING, Brit. Anim. p. 286.—Brit. Marine Conch. p. 130.—DILLW. Recent Shells, vol. ii. p. 1037.—WOOD, Index Test. pl. 37, f. 46.—SOWERBY, Genera Shells, Patella, f. 5.—KRAUSS, Sud-Afrik. Conch. p. 57.

*A South African species (Natal, &c.); introduced by Donovan—for Pennant's shell is too obscure for identification—as found on the western coast by Mr. Laskey.*

### ACMÆA, ESCHSCHOLTZ.

Shell ovate, conical, with a subcentral anteal apex; surface smooth or with radiating striations; muscular impression crescentic or horse-shoe shaped, interrupted in the region of the head.

Animal with two subulate tentacles bearing eyes on the outer sides of their swollen bases; mantle-margins fringed;

branchiæ forming a pectinated plume lodged in a cervical cavity; foot large, ovate, with plain sides; buccal mass with cartilaginous jaws; lingual ribband long, copiously armed with teeth, three of which are borne obliquely on each half of each transverse series, the two halves forming distinct squares.

This excellent genus was founded by Eschscholtz in 1833, with a full understanding of both animal and shell. The latter can with difficulty be distinguished from that of *Patella*, an absence of a nacreous gloss on the upper surface being the chief difference. The group was constituted by several authors almost simultaneously, so that it becomes difficult to determine whose name has priority. It appears to have been first indicated (but without a definition) under the name of *Tectura* by Audouin and Milne Edwards, who observed that the so-called *Patella virginea* had an animal presenting peculiarities of generic value at least. The ill-chosen name *Patelloidea* was given to it by Quoy and Gaimard, and *Lottia* by J. E. Gray.

Several species of *Acmæa* occur in both hemispheres. Some of them inhabit water of considerable depth.

### A. TESTUDINALIS, Müller.

Variegated with brown and white; spatula-mark more or less painted with brown.

Plate LXII. fig. 8, 9, and (Animal) Plate AA, fig. 2.

*Patella testudinaria*, MÜLLER, Prodr. Zool. Dan. p. 237.—GMEL. Syst. Nat. p. 3717 (var. Norveg.)

„ *testudinalis*, MÜLLER, Prodrom. Z. D. p. 237, No. 2872. — Brit. Mar. Conch. p. 131. — O. FABRIC. Fauna Grœnland. p. 385. — Bosc, H. N. des Coquil. vol. iii. p. 216.—DILLW. Recent Shells, vol. ii. p. 1045. —WOOD, Index Testac. pl. 37, f. 63.—DESH. Lam. Anim. s. Vert. vol. vii. p. 543.

„ *tessellata*, MÜLLER, Zool. Dan. No. 2868 (teste Beck).

*Patella testudinaria Grœnlandica*, CHEMN. Conch. Cab. vol. x. p. 325, pl. 168, f. 1614, 1615.

*Die Schildkröten-patelle var. b*, KÄMMERER (1786), Cab. Conch. Rudolst. p. 12, pl. 2, f. 4, 5.

*Patella Clealandi*, SOWERBY, Trans. Linn. Soc. vol. xi. p. 621.—FLEMING, Brit. Anim. p. 287.—MAWE, Introd. Linn. Conch. pl. 32, f. 7.

„ *amœna*, SAY, Journ. Ac. N. S. Philadelph. vol. ii. p. 223.

„ *clypeus*, BROWN, Ill. Conch. G. B. (edition without text), pl. 37, f. 9, 10. — FORBES, Mag. Nat. Hist. vol. viii. p. 592.

*Lottia testudinalis*, FORBES, Malac. Monens. p. 34 (animal).—BROWN, Ill. Conch. G. B. p. 64, pl. 20, f. 9, 10. — GOULD, Invert. Massach. p. 153, f. 12.

*Patelloida amœna*, COUTHOUY, Boston Journ. Nat. H. vol. ii. p. 171. — LEA, Trans. Americ. Phil. Soc. (new ser.) vol. vii. p. 73.— DEKAY, New York Fauna, Moll. p. 162, pl. 9, f. 196.

*Acmæa testudinalis*, HANLEY, Brit. Mar. Conch. p. xxxii. f. 103.

The *little tortoise-shell Limpet* has an oval or elliptic contour, is either depressed or depressed-conical, and has the surface flattish, and not convex, as in certain allied exotic species. The vertex, which is moderately inclined, is rather acute when not worn, and is more frequently pale-coloured than otherwise. The shell is generally thin, but not transparent, and is merely sculptured by very fine and extremely numerous crowded radiating striæ, that are only slightly raised, a little undulating, and very densely, but almost invisibly, decussated by the extremely minute concentric wrinkles, that concentrically traverse the exterior. The painting is very elegant, the external pattern, which is very variable, being effected by a marbling or interlacement of rufous brown of various intensities, with a more or less impure white, so that either tint occasionally predominates. Frequently the brown forms a rather coarse network upon a pale ground, often it is disposed in very wavy and generally commingling streaks, or there is an union of both patterns on the same shell; more rarely the surface is almost entirely brown, or white, with a few radiating brown lines. Within, the margin itself, which is rather flattened, exhibits the external colouring, and often presents an articulated appearance; the spatula, or central mark, is more or less stained with brown, and the intermediate portion is enamelled with porcelain or bluish white. The edge is acute and quite entire.

The animal is entirely white; the margin of the mouth has considerable expansion, and is fringed with minute white cirrhi, which are quite inconspicuous when it is taken out of the water. The head bears two rather long and slender tentacula, having eyes at their internal bases. When the creature is active, the long lanceolate branchial plume is conspicuous, projected from its cavity on one side of the head, and extends some distance even beyond the shell. The disk of the foot is oval and very broad, and the sides quite plain and not steep. The tongue is long and is divided into a series of sections, each composed of two squares, the centres of which are of a bright yellow. On each square there are two conspicuous hooked teeth and a denticle, and the upper angles are produced.

This Mollusk is a northern species of littoral habits, and does not make its appearance on the southern coasts, if indeed anywhere on the shores of England and Wales, though, as it appears to have a tendency to migrate southwards, it may be found hereafter considerably beyond the limits we here assign it. The locality "Bangor," assigned to it by Mr. Sowerby, refers not to Bangor in North Wales, but to a place of the same name in the north of Ireland. On the Irish shores it has found its way as far south as Dublin Bay, in which well-searched district it has been noticed only of late years; it is there "abundant, near Williamstown, on stones above low-water-mark" (Hassall). It has appeared since 1836, and multiplied considerably on the north coast of the Isle of Man (E. F.), and is not rare in the north-east of Ireland (W. Thompson). In Scotland it is more common, being abundant between tide-marks in many places in the Clyde district, and generally through the outer and inner Hebrides (E. F.). Mr. M'Andrew has dredged it in four fathoms at Stornaway, and in twelve fathoms north of Shapinsha in the Orkneys, where Lieut. Thomas has found it also on the shores of Kirkwall Bay.

It inhabits the coast of Norway, Greenland, and Boreal America. It is found fossil in pleistocene strata in Sweden.

### A. VIRGINEA, Müller.

Small, rayed with pink (or reddish liver colour) and white; spatula-mark not brown.

Plate LXI. fig. 1, 2.

*Patella virginea*, MÜLLER, Prodr. p. 237; Zool. Danic. pl. 12, f. 4, 5. — MAT. and RACK. Trans. Linn. Soc. vol. viii. p. 234. — RACK. Dorset Catalog. p. 59, pl. 14, f. 11.—TURT. Conch. Diction. p. 136. — FLEMING, Brit. Anim. p. 287. — BROWN, Ill. Conch. G. B. p. 63, pl. 20, f. 1, 4, 6. — Bosc, H. N. Coquilles, vol. iii. p. 209. — DILLW. Recent Shells, vol. ii. p. 1052. — WOOD, Index Test. pl. 38, f. 81. — DESH. Lam. Anim. s. Vert. vol. vii. p. 543.

„ *parva*, DA COSTA, Brit. Conch. p. 7, pl. 8, f. 11.—DONOV. Brit. Shells, vol. i. pl. 21, f. 2. — MONT. Test. Brit. vol. ii. p. 480; Suppl. p. 154.

„ *pulchella* (YOUNG), FORBES, Mag. Nat. H. vol. viii. p. 591, f. 61.—Brit. Mar. Conch. p. 132.

? *Lottia pulchella* (YOUNG), FORBES, Malac. Monens. p. 34 (animal).

„ „ „ BROWN, Illust. Conch. G. B. p. 64.

„ *virginea*, ALDER, Ann. Nat. H. vol. viii. p. 404.—JOHNSTON, Berwick. Club, vol. ii. p. 34 (with animal). — MACGIL. Moll. Aberd. p. 177.

*Acmæa virginea*, HANLEY, Brit. Mar. Conch. p. xxxii.

*Patella æqualis* (FOSSIL), SOWERBY, Min. Conch. pl. 139.

*Tectura virginea* (FOSSIL), SEARLES WOOD, Crag Mollusca, pt. 1, p. 161, pl. 18, f. 6.

Like most Limpets, this elegant little shell is liable to a greater or lesser elevation of form and a corresponding alteration of the basal outline. In the more depressed individuals the latter is generally elliptical, and the vertex, which is always more or less anterior, is more inclined and advanced; in the more conical examples it is rounded-oval, and the vertex is blunter and more central. The shell is more frequently thin and subpellucid than otherwise, and is never very glossy; it is not laterally compressed, but, on the contrary, rather inclined to spread at the sides. It is moderately arched behind, but is little convex elsewhere; the anterior slope, for the most part, is more or less abrupt. The surface seems smooth, but when examined displays, besides the fine wrinkles of increase, a considerable number of obsoletely elevated, radiating lines. The exterior is prettily radiated with pink or reddish liver-colour upon a ground of greyish white or horn-colour, and in full-grown specimens exhibits, occasionally, but not commonly, an additional kind of net-work in the paler portions, lines of the darker hue immeshing, as it were, numerous small and somewhat oval-shaped spots of the lighter tint. The rays are generally twelve or fourteen in number, and moderately broad; they are much more conspicuous towards the base, and, indeed, are generally obsolete upon the vertex. The inside, if not coated with a thin layer of porcelain white, faintly shows the external painting; frequently two short rays of a dark red colour emanate from behind the vertex at acute angles to each other, so as to resemble the letter V truncated at its narrower extremity. The basal edge is quite entire, is rounded at both ends, and more or less arched on each side. Our larger specimens measure about five and a half lines in length, and four in breadth.

Young specimens from deep water are very tender, and have their red markings so disposed as to form moniliform rays on a bluish ground, which, when the creature is alive, appears even of a vivid blue colour. This is the condition to which the name *Lottia pulchella* was given.

The animal of this pretty Limpet has attracted the attention of many observers, from whose notes, published and unpublished, and our personal observations, we are enabled to describe it at length. It is of a yellowish white colour, with the exception of the margin of the mantle, which is spotted with pink at intervals, corresponding to the rays of colour upon the shell. The mantle is bordered by tentacular filaments; these, Dr. Johnston has remarked, are placed about half a line within the margin, and are all directed inwards and towards the body: hence the discrepancies between the figures and descriptions of the animal, which has been represented and described as having the margin entire. On the sides of the head are the tentacula, long and subulate, swollen at their bases, on the outsides of which are placed the eyes. The tongue, according to Lovèn, differs from that of *testudinalis*, in having the anterior margins of the square transverse divisions entire and the three teeth on each square of more nearly equal dimensions, and placed regularly obliquely. The branchial plume, which has been carefully examined by Mr. Alder, is coarsely pectinated, and is often conspicuously exserted. The foot is oval and fleshy: Mr. Clark observes that there is a slight groove on the under part of its posterior extremity, and states that "when the ovarium discharges the membranous bag which contains the embryones, the posterior part of the foot serves as its nidus until such time as the young come forth from the membranous sac, when it throws off the empty films from its foot."

This Limpet is universally distributed around our coasts, adhering to shells and stones in various depths of water from the laminarian zone to as deep as twenty or thirty fathoms, most plentiful in from five to twelve fathoms, and occasionally, especially in the Hebrides, where it grows larger than in most places, occurring between tide-marks. It inhabits the Scandinavian and Celtic seas generally, and is found fossil in the red crag and northern drift.

## PILIDIUM, Forbes and Hanley.

Shell ovate, conical, with an eccentric anteal apex; surface with radiating striæ; interior with a crescentic muscular impression, interrupted in the region of the animal's head.

Animal with two subulate tentacles unprovided with eyes; mantle-margin simple; branchial plume cervical; foot large, ovate, with plain sides; lingual ribband composed of a single series of squares, on each of which a single trilobed tooth is borne, flanked on each side by two distinct accessorials.

The eyeless head, even-edged mantle, and peculiarly constructed tongue of the *Patella fulva* of the Zoologia Danica forbid our associating it, as has been hitherto done by modern writers, with *Acmæa*, and demand for it the establishment of a peculiar genus. The shell so closely resembles that of *Acmæa*, that from it alone the important differences presented by the animal could not be predicted. The only recorded living British species is found fossil in beds of coralline crag age.

### P. FULVUM, Müller.

Plate LXII. fig. 6, 7, and (Animal) Plate A. A. fig. 3.

*Patella fulva*, MÜLLER, Prod. p. 237 ; Zool. Dan. pl. 24, f. 1, 2, 3.—GMELIN, Syst. Nat. p. 3712.—Bosc, H. N. Coquilles, vol. iii. p. 209.—DILLW. Recent Shells, vol. ii. p. 1053.—WOOD, Index Testac. pl. 38, f. 83.

„ *Forbesii*, SMITH, Mem. Werner. Soc. vol. viii. p. 107, pl. 2, f. 3.—BROWN, Illust. Conch. G. B. pl. 57, f. 3, 4.

*Acmæa fulva*, HANLEY, Brit. Mar. Conch. p. xxxii.

*Tectura fulva*, SEARLES WOOD, Crag Mollusca, pt. i. p. 161, pl. 18, f. 7, a, b.

This beautiful little shell is, both within and without, of a pure reddish orange colour, but varies in intensity of hue, as well as in occasionally being only rayed with orange upon a paler and more fulvous ground, although in general its tint is uniform. It is thin, depressed conical, and rather inequilateral. The vertex is by no means elevated, and is curved greatly forward, so that the descent from it anteriorly is rather abrupt, whilst the slope posteriorwards is gently arcuated: there is no particular lateral compression. The base is more or less elliptical, but rather broader behind, and rather more obtuse in front. The outer surface is adorned with minute radiating, elevated lines, which are numerous, but not closely disposed, and are rendered granular by the crowded decussation of still finer and almost microscopical lamellar lines. The basal margin is acute, and entire, or very nearly so.

One of our largest specimens only measures a quarter of an inch in length, and but slightly exceeds two lines in breadth.

The animal is white. Its head is not very large in proportion to the body, and terminates anteriorly and below in a short puckered muzzle. The tentacula are rather short for the tribe, and obtuse; they have swollen bases, but exhibit no traces of eye-spots. The mantle has its edge quite plain. The sides of the foot are not very steep, and the disk of that organ is oval. The branchial plume is not exserted when the animal is in motion. The tongue when moderately magnified presents the appearance represented in our figure (Plate A A, fig. 3, b) as if it were composed of a series of square divisions, each with a bright yellow space in the centre, in front of which is a strong curved brown tooth flanked by two brown denticles, and bordered by uncoloured hooked teeth. A higher magnifying power shows that the uncoloured lateral teeth are accessorial (*uncini* of Lovèn). The teeth of the Norwegian ally, the *Patella cæca* of Müller, present a similar arrangement according to Lovèn, but exhibit important distinctions in detail.

This mollusk was first announced as a member of the British Fauna by Mr. Smith, of Jordan Hill, who dredged it in the Clyde, off Arran. We believe it had previously been found (though not published) by Miss M. Ball adhering to a stone dredged from deep water on the coast of Ireland. It has since been taken on the west coast in fifty and sixty fathoms water off Cape Clear and Mizen Head (M'Andrew). Adhering to a *Pinna* taken on the coast of Cork (J. D. Humphreys). It is not rare in the Clyde district, the Hebrides, and off the Zetland Isles, where it occurs in depths of water between twenty and eighty fathoms (M'Andrew and E. F). In thirty fathoms twenty miles north of Kennard's Head, Aberdeenshire (Thomas). It inhabits the Norwegian seas, and is found fossil in the coralline crag.

## PROPILIDIUM, Forbes and Hanley.

Shell obovate, conical, with an eccentric posteal apex; surface with radiating striæ; interior with a crescentic muscular impression interrupted in the region of the head.

Animal with two subulate tentacles unprovided with eyes; mantle-margin simple; branchial plume (two plumes?) cervical; foot large, orbicular, with plain sides; buccal mass with corneous jaws and a lingual riband, like those of *Pilidium.*

We have constituted this genus for a very remarkable and rare mollusk, which, whilst its shell reminds us strongly of an *Emarginula* without a slit and has a vertex holding the same position with respect to the head of the animal—an arrangement rarely seen among the *Patellidæ*—has its soft parts very similar in most respects with those of *Pilidium.* It presents considerable resemblance to some limpets referred to the genus *Scutella*, but not sufficient to permit us to refer it to that group. In *Scutella Arabica* there are two powerful muscular scars, one on each side of the interior of the shell, which seem to indicate differences of consequence in the animal.

### P. Ancyloide, Forbes.

Plate LXII. figs. 3, 4, 5, and (Animal) Plate A.A, fig. 4.

? *Patella cæca*, Müller, Zoolog. Danic. i. p. 45, pl. 12, f. 1, 2, 3, from which Gmel. Syst. Nat. p. 3711, and Dillw. Recent Shells, vol. ii. p. 1052.

„ ? *Ancyloides*, Forbes, Ann. Nat. Hist. vol. v. (1840) p. 108, pl. 2, f. 16. —Brit. Marine Conch. p. 133.

? „ *candida*, Couthouy, Boston Journ. Nat. Hist. vol. ii. p. 86, pl. 3, f. 17. — Gould, Invert. Massach. p. 152. — Dekay, New York Fauna, Moll. p. 161.

? *Patella cerea*, MÖLLER, Index Moll. Grœnland. p. 16 (=candida, teste Möller).
? „ ? *exigua*, FORBES, in Thompson's Report, Brit. Assoc. Rep. for 1843, p. 259.

It is possible, from the small size of the very few examples as yet taken, that this extremely rare Limpet may not have reached its full stature; and that the shape and sculpture may not be precisely identical with that of the species when fully developed. Hence our description may not precisely correspond with some of the individuals which may hereafter be discovered: hence, too, our suspicion that this shell may prove the immature state of the *Patella cæca* of Müller.

The individual now before us is conical, thin, semitransparent, a little oblique, somewhat laterally compressed, and of a pure white, both within and without. The basal margin has a rather elongated elliptical figure, is rounded and nearly equally broad at both ends, and is convex at the sides. The vertex is sharply pinched up, recurved, a little spiral, and subcentral, or rather before the middle of the shell; the slope from it forwards is at first arcuated, and then rather abrupt and but little convex; the slope posteriorwards is much more gradual, and, except immediately below the spire, is almost straight. The external surface, which is not polished, is densely covered with very delicate elevated radiating lines, that are concentrically and closely decussated by equally fine imbricating lamellar ones, which produces a fimbriato-granular appearance at the intersection of the two. The inner edge is nearly entire, or only subcrenulated by the external sculpture.

The length of the individual above-described, is only two lines; examples of *cæca* sent to us from Sweden, by our eminent friend, Professor Lovèn, of Stockholm, of about twice the length, and quadruple the area, differed in the following respects, which may, probably enough, depend upon age. The shape was much more depressed, slightly broader, and not so pinched at the sides; the vertex was blunt, not at all spiral, and much less central. Near the margin the radiating granular striation was the only visible sculpture.

The animal, which is of sluggish habits, is of a dingy-white colour, and not large in proportion to its shell. The head is turned away from the apex, and is rather small; it is furnished with two rather short obtuse tentacles, which have no eyes upon their bases. The margin of the mantle is quite plain. The sides of the foot are narrow and the disk of that organ oval. There appear to be two short triangular branchial plumes in the neck-cavity; the cilia upon them are large. The tongue is very long, and the brown central spines conspicuous, under the microscope resembling bramble-thorns in miniature.

*Propilidium Ancyloide* was added to the British Fauna by Mr. Smith, of Jordan Hill and one of the authors of this work when dredging in Lamlash Bay, in 1839. Since then we have taken it alive, in from thirty to ninety fathoms water, off the east coast of Mull; and, dead, in thirty fathoms, off Lismore (M'Andrew and E. F.). It has also been found on the west coast, where it was "obtained by Mr. Hyndman, many years ago, on oysters from Strangford Lough" (Thompson). "Two specimens, dredged alive off Ballantrae, Ayrshire, in 1842, were sent me by Mr. Edmund Getty. Dead shells are not uncommon among comminuted nullipores dredged at Lamlash, Arran, in 1846, by Major Martin and the Rev. David Landsborough" (W. Thompson).

# DENTALIADÆ.

Although we place the singular genus of *Gasteropoda*, which constitutes this family, in this place, as if it were a transition onwards from *Patella* to the fissurated Limpets —a position accordant with the view taken of its structure by Deshayes, who first decided on its molluscan nature,— we do so merely provisionally, and not without strong misgivings: for the account of the anatomy of *Dentalium Tarentinum*, just published by Mr. Clark, in the "Annals of Natural History," for November, 1849, throws so much new light on its structure, that it might have been better had we placed the group between *Chiton* and *Patella*.

That the animal of the tooth-shell was not an *Annellid*, was first observed by the celebrated Savigny; that it was a true mollusk, was first determined by Deshayes, and that it should constitute a distinct order of *Gasteropoda*, to which the name of *Cirrhobranchia* was given, was first proposed by De Blainville. In the Memoir of Deshayes, communicated to the Natural History Society of Paris, in 1828, there is a very full account of the animal; in some very essential particulars, however, the French and English malacologists are at variance.

The shell of the *Dentaliadæ* is a cylindrical testaceous tube, open at both ends, the anterior orifice being much the wider. The animal is shaped like the shell, and so far as its characters may be regarded as of ordinal or family distinction, presents some remarkable features in important parts of its organisation. In the following summary of the characters of *Dentalium*, we have adopted the views of Mr. Clark, the more willingly since they appear to us to get rid of some anomalies recorded to exist in its structure, which rendered the creature's affinities extremely dubious. The most essential differences between the two accounts relate to the respiratory and circulatory organs, and to the position of the vent. According to Deshayes, the branchiæ are grouped in the form of two tufts of long soft filaments with clavate extremities, one on each side of the animal's neck. According to Mr. Clark, on the other hand, the branchiæ are "two symmetrical, sublateral, and somewhat post-centrally situated organs, having their bases fixed on, and hanging from, the concave surfaces of the animal, with their points vertically parallel to the bases; they are united at their inner surfaces by a bridle of branchial strands arranged symmetrically." The latter observer finds the heart at the anterior end of the branchial cavity, and holds this peculiarity of position of that organ to have relation to the fact that the water, in this genus, flows to the branchiæ by the posterior aperture instead of in front. The organs taken for branchiæ by Deshayes, are regarded by Clark as salivary glands, and the branchiæ of Clark are the lobes of the liver for Deshayes. As there appears to be a distinct liver in a more usual position, and as the relation of the circulation to the branchiæ has been clearly made out by the English naturalist, the usually accepted view of the "cirrho-branchiate" character of *Dentalium* becomes untenable. According to Deshayes, the vent in this genus is anomalous in position among the *Gasteropods*, being posterior; Clark finds the vent at the base of the branchial cavity, under the mantle, about the middle of the shell. For other points of difference and of detail, we refer our readers to the papers cited.

## DENTALIUM, Linnæus.

Shell symmetrical, cylindrical, forming a long tube, its anterior orifice open, without constriction, to the greatest breadth of the shell, the posterior extremity attenuated and perforated; surface smooth or annulated, or longitudinally ribbed or striated, or with decussating striæ.

Animal elongated, attached to the shell near its hinder extremity; head rudimentary, eyeless, and without tentacles, cirrhated on the lip: mantle circular, thick and fleshy in front, thin posteriorly, capable of investing the entire frontal part of the body; foot placed centrally and anteriorly, consisting of a pointed cone, flanked by two symmetrical side lobes, and mounted on a long pedicle, grooved on both surfaces, centrally hollow, the cavity communicating with the stomach. Branchiæ and heart as already noticed. Sexes probably united. Main mass of the nervous system in the form of four nerve ganglions, connected to form a collar around the œsophagus. Stomach furnished with a strong gizzard anteriorly, vent subcentral. Lingual membrane (according to Lovèn) broad, ovate, each section with a single-toothed rachis, flanked on each side by a single lateral.

These mollusks are animal-feeders, devouring with avidity Foraminifera, and sometimes small bivalves. Mr. Clark has found species of as many as eleven distinct genera in the pouches on the two sides of the mouth, or in the stomach of *D. Tarentinum.* On the affinities of this genus, he remarks " the symmetrical subventral position of the branchiæ, the posterior flow of water to them, and the resemblance of the foot to that of some of the bivalves, combined with the similar character of its action, appear in a striking manner to show its connection with the Conchiferæ; whilst by its œsophageal cerebral ganglions, and completeness of the circulation, it has established its claims as a Gasteropod. There are also traces of alliance with some of the inferior classes; the red blood and vermiform configuration of the posterior part of the animal shows some of the characters of the Annelides."*

There are some shells which may readily be confounded with *Dentalia*. These are the testaceous tribes of Annelides, of the genus *Ditrupa*. A slight constriction around their orifices is usually an indication of their true nature.

### D. ENTALIS, Linn.

Porcelain white, lustrous, not at all striated: posterior end emarginated.

Plate LVII. fig. 11.

*Dentalium entalis*, LINN. Syst. Nat. ed. 10, p. 785, and ed. 12, p. 1263, in part; Fauna Suecica, ed. 2, p. 534.—MONT. Test. Brit. p. 494 (in part only).—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 237.—TURT. Conch. Diction. p. 37, 40.—JOHNSTON, Berwick Club, vol. ii. p. 38, animal.—MACGIL. Moll. Aberd. p. 200.—Brit. Marine Conch. p. 1.—BROWN, Illust. Conch. G. B. p. 117, pl. 56, f. 7 (probably).

Worn individuals of the succeeding species have so generally been confused with the present one, that the earlier synonyms of this shell are of difficult determination.

Linnæus, in the tenth edition of his Systema, confounded the two species, but the expression "lævi," added in the twelfth, is more applicable to the northern shell. The

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* Clark in Annals Nat. Hist. ser. 2, vol. iv. p. 328.

*entalis* of the "Fauna Suecica" evidently, from its locality, belongs to the present species.

The tube is subarcuated and sub-cylindraceous, the curvature at the broader end being only trifling, and the posterior attenuation in the majority of examples by no means rapid; occasionally, however, this attenuation and arcuation is less gradual in its progress. The surface, which is nearly opaque and of a shining porcelain white, at times, though rarely, ringed with duller or even fulvous lines of growth, but never tinged with pink even at the narrower extremity, is perfectly free throughout from all sculpture whatsoever. The posterior termination has either a labial projection which is rather broadly fissured dorsally (*i. e.* upon the arched side of the tube) or if it have not experienced that reparative process is then very tapering, and has a short shelving notch-like dorsal fissure; it is always entire upon the ventral or incurved side of the shell. In certain specimens the close approximation of the concentric lines of growth produce a somewhat annulated appearance.

Mature individuals of twenty-two lines in length only measured a fifth of an inch at the broader end; whilst the diameter of the anterior extremity in a young and arcuated example only an inch long, was all but the sixth of an inch.

Dr. Johnston has given a notice of the animal; "the form is like that of the shell, round and tapering gradually to the posterior extremity; it is smooth, whitish, and closely invested with a thin pellucid membrane, beneath which two strong satiny ligamentous muscles are seen lying along the ventral surface, adhering closely, and each of them divided into a broad and a narrow slip * * *. The collar is very thick and fleshy, and makes a complete circle, through which the foot can be pushed at pleasure. The foot forms the anterior portion of the body; it is cylindrical, thick, fleshy, pointed with a conical process, and cleft below; and in the groove we see the mouth in the shape of a compressed process, projecting forwards, and with its edge fringed with short tentacular papillæ."* Mr. Clark remarks that the branchiæ of this species are of a paler green, more scanty, thin and delicate.

It is found all round our coasts, and is especially abundant in the north. On the southern coasts of England it is rare, and its place is taken by the next species. It lives buried in sand or sandy mud in from ten to one hundred fathoms water; we have taken it most abundantly in from forty to seventy fathoms. On the coasts of the continent it ranges from Norway to Spain.

### D. TARENTINUM, Lamarck.

Sallow white, occasionally pink at the narrower extremity; posterior end with fine longitudinal striæ, not emarginated.

Plate LVII. fig. 12.

PETIVER, Gazop. pl. 65, f. 9.—GINANNI, Opere Postum. pt. 2, pl. 1, f. 2.

*Dentalium entalis*, LINN. Syst. Nat. ed. 10 (in part).—PENNANT, Brit. Zool. ed. 4, vol. iv. p. 145, pl. 90, f. 154 (probably). — PULTENEY, Hutchins, Hist. Dorset, p. 52. — MONT. Test. Brit. vol. ii. p. 494 (var.).—RACK. Dorset Catalog. p. 59, pl. 22, f. 10. —LAM. Anim. s. Vert. (ed. Desh.) vol. v. p. 595, in part. —MAWE, Linn. Conch. pl. 33, f. 5.—DESH. Monog. Dental. (and in Mem. Soc. H. Nat. Paris, vol. ii.) p. 39, pl. 2, f. 2 (and anatomy, pl. 1); Encyclop. Méth. Vers. vol. ii. pt. 2, p. 78, in part.—PHILIPPI, Moll. Sicil. vol. i. p. 243; vol. ii. p. 206. — Penny Cyclop. vol. viii. fig. at p. 405. — REEVE, Conch. System. vol. vii. pl. 130, f. 3. — CHENU, Ill. Conch. Dental. pl. 2, and pl. 3, f. 2, c.

„ *vulgare*, DA COSTA, Brit. Conch. p. 24, pl. 2, f. 10.

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* Trans. Berwick. Nat. Club, vol. ii. no. 10, p. 39.

*Dentalium striatum*, MONT. (not authors) Test. Brit. vol. ii. p. 492, and Suppl. p. 156 (probably).
,, *Tarentinum*, LAM. Anim. s. Vert. (ed. Desh.) vol. v. p. 596.—HANL. Brit. Marine Conch. p. xvii. f. 6. — DELES. Rec. Coq. pl. 1, f. 4.
,, *dentalis*,* TURT. (not authors) Conch. Diction. p. 37.—FLEM. Edin. Encycl. p. 66. — Brit. Marine Conch. p. 2. — BROWN, Illust. Conch. G. B. p. 117, pl. 56, f. 8.
,, *labiatum*, TURT. Conch. Diction. p. 38.—Brit. Marine Conch. p. 3.—BROWN, Illust. Conch. G. B. p. 117, pl. 56, f. 4, 5.
,, *politum*, TURT. (not authors) Conch. Diction. p. 38.
,, *læve*, TURT. Conch. Diction. p. 256.—Brit. Marine Conch. p. 3.
, *entale* (FOSSIL), SEARLES WOOD, Crag Mollusca, p. 169, pl. 20, f. 2, a, b.

The tube of this *Dentalium* presents much similarity to the preceding, but differs very essentially in the characters of its hinder extremity. It is strong, cylindraceous, comparatively sudden in its attenuation, moderately arcuated, and of a nearly opaque and squalid white, occasionally tinged with rose-colour at its narrower end, and sometimes variegated with ochraceous rings. The general surface is not highly polished but only moderately shining; it is smooth in the adult, but in the young, and towards the posterior termination of mature examples, fine, equal, and very numerous (about thirty) raised longitudinal striæ are apparent, that, for the most part are narrower than their interstices, and are frequently preceded by, or intermingle with, very minute longitudinal striulæ, which are often visible when from the truncation, so common in this species, the terminal costellar striæ are absent. The posterior end of the younger and middle-aged examples tapers to a very fine point, but never displays either fissure or emargination; when excised, as it generally is in the adult, the reparative tube is very slender, all but entire, occasionally rather produced, and never dilated at the extremity.

The majority of specimens are much shorter than *D.*

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* The diagnosis of *dentalis* in the Linnæan Transactions (vol. viii. p. 237), being copied from the "Systema Naturæ," does not apply to any British species.

*entalis*, seventeen lines being above the standard length of the species in Great Britain. The broader end of an individual of that size measured the fifth of an inch. Worn shells may not unfrequently be separated from the preceding species (which, by the bye, is peculiarly apt to display erosion at the narrower end) through the occasional appearance of an annular substratum of colouring matter at that extremity. A kind of articulated appearance is sometimes produced through the striæ being crossed by chalky rings of growth.

An examination of the original types of Turton's descriptions, most kindly forwarded to us by Mr. Jeffreys, has enabled us to determine the *dentalis*, *labiatum*, and *politum* (subsequently changed to *læve*) of that author with positive certainty. The first is the immature state, the second the truncated adult, with its reparative tube in perfection, whilst the third was constituted from dead and worn individuals of the last mentioned form. Mediterranean examples of *Tarentinum* are more elongated in proportion than the British ones, and their striæ occupy a larger portion of the entire surface.

As the name *entalis* more properly belongs to the northern shell, we have adopted that given by Lamarck to a variety of this species. Da Costa's name of *vulgare* is certainly prior, but it was given with the idea of ejecting the Linnæan name of a species that he considered at the same time to be identical with his own. The marked ill-will towards Linnæus and his nomenclature so pertinaciously displayed both in his conversation and in his "British Conchology," arose from his baffled desire of being admitted, through the influence of Linnæus, to an honorary membership in a Swedish Natural-Historical Society.*

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* Smith's Correspondence of Linnæus.

The animal is minutely described by Mr. Clarke in the valuable paper already cited, and the features we have mentioned in our notice of the characters of the genus are taken from his account of his species. It differs from the preceding in being of less slender form, of a yellowish white colour, instead of pure white, and possessing dark greenish brown, elongated, suboval branchiæ.

This tooth-shell may be regarded as a member of the southern regions of the British Fauna, and, though not rare in many places, is on the whole a much more uncommon species than the last. It inhabits the sandy shores of Kent, Sussex, and Dorset (S.H.) ; "the coralline zones of the South Devon coasts, five or six miles from land, in twelve to fifteen fathoms water" (Clark); Torbay (Alder); Ilfracombe (Miss Alder). East side of Lundy Island in from seven to twenty-five fathoms (M'Andrew). Mr. W. Thompson, in his "Report on the Irish Fauna," indicates its presence in both east and west shores of Ireland ; absent from the northern coasts.

It ranges to the Mediterranean ; it is found fossil in the pleistocene tertiary at Bridlington.

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The *D. gadus* of Montagu, and the *subulatum* of the British Marine Conchology, are species of *Ditrupa*, and consequently belong to the Annelides ; Turton's type of *D. clausum* is merely a portion of a quill.

### SPURIOUS.

### D. SEMISTRIATUM, Turton.

*Dentalium semistriatum*, TURT. Conch. Diction. p. 39, f. 68.—Brit. Mar. Conch. p. 3.

Notwithstanding that this species bears a marked resemblance to *D. inversum*, the absence of the characteristic and peculiarly seated fissure, evidences an essential distinction. We have compared the two specimens which belonged to Turton, with a perfectly fresh individual, in our own cabinet (the locality is unknown to us); and, although the finely tapering posterior termination is uninjured, there is not the slightest appearance of any slit. This species is slender, semi-transparent, moderately arcuated, and of a pure white (stained, however, in one of the Turtonian examples, with pale red at the narrower extremity). It very slowly enlarges from the middle anteriorwards, so that the mouth is not at all dilated; behind it tapers to a very fine point. Very numerous raised longitudinal lines, that are scarcely equal in breadth to their interstices, occupy about one-third of the shell at its lustreless hinder extremity; the surface then becomes highly polished and smooth; but exhibits several obsolete rings of growth, which prevent it from being quite level. The length of our own largest example was nearly one inch and a quarter; its breadth at the larger orifice barely exceeded the tenth of an inch.

*An exotic shell, said by Turton to have been taken in Dublin Bay. The* D. semipolitum *of Broderip and Sowerby (Zoolog. Journ. vol. iv. p.* 369,) *may possibly prove identical, as the only part of the very brief description which does not correctly apply, is the statement, that the striæ occupy one half of the shell.*

### D. OCTANGULATUM, Donovan.

*Dentalium octangulatum*, DONOV. British Shells, vol. v. pl. 162.—Brit. Marine Conch. p. 2 (part only).— BROWN, Illust. Conch. G. B. p. 117, pl. 56, f. 2.

„ *octogonum*, LAM. (ed. Desh.) Anim. s. Vert. vol. v. p. 591, (var.).— DESH. Monog. Dent. p. 32 (pl. 2, f. 5, 6!); Encycl. Méth. Vers, vol. ii. pt. 2, p. 74.—SOWERBY, Zool. Journ vol. iv. p. 181.—SOWERBY, Conch. Man. f. 2.—DELES. Rec. Coq. pl. 1, f. 1.—CHENU, Ill. Conch. Dental. pl. 1, f. 22.

„ *striatulum*, TURT. Conch. Diction. p. 38 (part only).— MONT. Test. Brit. Suppl. p. 155.

„ *aprinum*, MAWE, (not authors) Linn. Syst. Conch. pl. 33, f. 1.

*An exotic species, said to be Chinese (?); introduced by Donovan as taken on the sands of Cornwall. The diagnosis of* striatulum *in the Linnæan Transactions* (vol. viii. p. 238,) *being taken from Gmelin, does not apply to any supposed British species. Turton in his description, confounds the* D. aprinum (*of Deshayes' Monograph*) *with this shell.*

## D. VARIABILE, Deshayes.

*Dentalium eburneum*, TURTON, Conch. Diction. p. 37.
„ *album*, TURTON, Conch. Diction. p. 256.—Brit. Marine Conch. p. 2.
„ *variabile*, DESH. Monog. Dental. p. 32 (pl. 2, f. 30!); Encyclop. Méth. vol. ii. pt. 2, p. 75.—SOWERBY, Zool. Journ. vol. iv. p. 182. —M. EDWARDS, Lam. Anim. s. Vert. (ed. Desh.) vol. v. p. 592.—CHENU, Ill. Conch. Dentalium, pl. 1, f. 27, 28, 29 (probably).

*An exotic species, said to be East Indian; introduced by Turton as not uncommon on the western coast! The name of* album *must succumb to the subsequent one given by Deshayes, since the description, which is by no means good (indeed without the types we could not have determined the species), is neither in Latin nor accompanied by an illustrative drawing.*

# CALYPTRÆIDÆ.

This group of Limpets consists of animals which have a patelliform shell, with an expanded and entire mouth, and an apex which exhibits more or less of a spiral conformation. The interior is either quite open or divided by a variously shaped shelly process. The animal has a distinct head and tentacula, the eyes being placed on the external bases of the latter organs. The muzzle is sometimes lengthened, but there is no true proboscis. The branchial plume is single. The tongue is studded with teeth ranged in rows of seven, that in the centre differently formed from the hook-shaped laterals. This dentition is very different from what is seen in the neighbouring tribes, and seems to indicate affinities with *Velutina* and other distant genera, which cast some doubts on the true position of the group. The foot has never any cirrhi ornamenting the sides.

In our seas there are but very few members of this family; in tropical regions they are numerous and greatly varied.

## PILEOPSIS, Lamarck.

Shell conical, entire, dilated at the aperture, and having the vertex, which is posteal, slightly recurved; outer surface usually striated, and invested with a corneous epidermis: interior with a horse-shoe muscular impression, interrupted in the region of the head; no internal partition.

Animal with a head produced into a proboscidiform muzzle; tentacula two, long, subulate, unconnected, with the eyes or bulgings at their external bases; mantle fringed at the margin; branchial plume single; foot strong, suborbicular, its sides plain. Tongue rather long with a cordate membranous border at its anterior extremity; lingual teeth (according to Lovèn) arranged in transverse series of seven, of which the central one is small and broad with a hooked apex, and the others long and hamate.

The shells of this genus are the most patelliform of their tribe, and resemble little caps of liberty. The animal is rather sluggish and sedentary, and sometimes secretes an imperfect shelly disk from its foot; hence it has been compared with *Hipponyx.* The group is a very ancient one, dating even to paleozoic times, and apparently extending its range to the oldest fossiliferous rocks. ACROCULIA, of Phillips, founded for some of these ancient forms of PILEOPSIS, scarcely differs generically. We have preferred using the name given by Lamarck to that of CAPULUS given by De Montfort, under the conviction that priority alone cannot be admitted as sufficient ground for the adoption of a *generic* appellation in Malacology, since in that case appellations given by ignorant dealers or authors, who, like Perry, did not even pretend to science, or such random and worthless empirics as De Montfort was, will have too often to be preferred before the nomenclature resulting from earnest and scientific study. *Specific* appellations had best be as often as possible determined by right of priority, since though the original description or figure might be bad, there was still the recognition of a distinct object on the part of the founder; but the establishment of a genus is entirely a matter of judgment, and though for convenience we may refer generic names to those who first proposed them, we cannot hold ourselves in justice bound to adopt any name without reference to the understanding on the part of its originator of its generic value.

### P. Hungaricus, Linnæus.

Plate LX. fig. 1, 2, (as Capulus H.) and (Animal) Plate C.C, fig. 3.

*Patella Ungarica*, Linn. Syst. Nat. ed. 12, p. 1259. — Pulteney, Hutchins, Hist. Dorset, p. 51. — Mont. Test. Brit. vol. ii. p. 486.— Maton and Rack. Trans. Linn. Soc. vol. viii. p. 230.— Rack. Dorset Catal. p. 58, pl. 23, f. 7. — Turt. Conch. Diction. p. 140, f. 76. — Born, Test. Cæs. Vind. p. 421, vign. at p. 414, fig. d.—Bosc, Hist. Nat. Coquilles, vol. iii. p. 206, pl. 25, f. 2. — Brookes, Introd. Conch. (1815), f. 125. — Dillw. Recent Shells, vol. ii. p. 1034. — Wood, Index Testac. pl. 37, f. 41. — Mawe, Linn. Conch. pl. 32, f. 2.

„ *Lepas, &c.* Martini, Conch. Cab. vol. i. p. 143, pl. 12, f. 107, 108.

„ *Hungarica*, Pennant, Brit. Zool. ed. 4, vol. iv. p. 143, pl. 90, f. 147.— Donov. Brit. Shells, vol. i. pl. 21, f. 1.

„ *pileus morionis major*, Da Costa, Elem. Conch. p. 12, pl. 1, f. 7.

*Large Fool's-cap Limpet*, Humphreys and Da Costa, Nat. Hist. Shells, pl. 4, f. 18.

*Pileopsis Ungarica*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 609. — Turt. Zoolog. Journ. vol. ii. p. 566. — Brit. Marine Conch. p. 135. — Brown, Illust. Conch. G. B. p. 60, pl. 20, f. 19, 20.—Crouch, Introd. Lam. Conch. pl. 14, f. 4.—Desh. Encycl. Méth. vol. ii. pt. 1, p. 153. — Philippi, Moll. Sicil. vol. i. p. 118, and vol. ii. p. 91. — Reeve, Conch. Syst. pl. 146.

*Amalthea maxima*, Schumacher, Syst. Test. (1817), p. 182.

*Capulus Ungaricus*, Sowerby, Genera Shells.—Sowerby (Jun.) Manual Conch. f. 240.

„ *Hungaricus*, Fleming, Brit. Anim. p. 363.—Forbes, Malacol. Monens. p. 33 (animal).—Johnston, Berwick Club, vol. ii. p. 33. — Macg. Moll. Aberd. p. 332.—Gray, Ency. Metrop. Moll. pl. 4, f. 13, 14.—Lovèn, Index Moll. Scandinav. p. 16 (Animal).

*Pileopsis Hungarica*, Cuvier, (ed. Croch.) Règne Anim. pl. 47, f. 7.

„ *antiquata* (young), Couch, (not authors), Cornish Fauna, p. 44 (from type).

*Capulus militaris*, Macg. Moll. Aberd. p. 333 (teste Jeffreys, from type).

The *Fool's-cap Limpet*, as it is familiarly called, was, from its peculiarity of form, one of the earliest species recognised by the British collector. Modifying its shape according to the peculiarities of its habitat, it is by no means symmetrical; its general outline, however, is subconical, or if viewed laterally, semicordate, reminding us forcibly of one of the valves of an *Isocardia*. It is tolerably strong, but not solid, rather transparent for its thickness, and under its drab or ashy brown pilose epidermis, which is sometimes dull and shaggy, sometimes as smooth and glossy as satin, is either pale flesh-coloured or white; in the latter case usually more or less tinged with yellow, in the former frequently stained internally with various intensities of crimson. The surface, which is often disfigured by irregular indentations, besides distant wrinkles of increase, is everywhere marked with simple rounded coarse raised striæ or narrow costellæ, whose interstices are of about the same breadth with them, and are unsculptured, except by such still narrower complementary costellæ as the gradual widening of the interstices demand. The vertex is spiral, a little inclined to one side, but only at its termination, where the rapidly attenuated whorls, if not loosely coiled, are only visible on one side; the penult whorl is always disunited from the shelving pillar-lip, and rarely, if ever, descends to its level. The inside is smooth, shining, more or less circular in marginal outline, and either white or stained with rose or a pinkish flesh-colour; the rim is not crenated.

The bases of some of our larger specimens measure only an inch and a half, and their height is one-third less, yet occasionally, and especially in foreign examples, these dimensions are greatly exceeded. Montagu mentions one from Salcomb Bay in Devonshire of two inches in diameter, and there are specimens of equal size in the cabinet of Mr. Jeffreys.

The animal is white or yellowish, its mantle pinkish-white or red colour, bordered by a fine bright yellow or orange fringe; the head is prominent, tumid, and produced in front into a proboscidiform muzzle, cloven at the extremity, and often tinged with brown: on each side of the head is a long, subulate, white or yellowish tentacle, bearing the eyes on a prominent bulging near the external base. The foot is stout, fleshy, and sub-orbicular, with plain sides; in front it is bordered by a slightly scalloped membrane.

This mollusk is generally distributed around our shores; though sparingly in most places. It is most abundant on the south coast of Devon, where the name of "Torbay Bonnet" is applied to it (S. H.), and in the Irish Sea around the coasts of the Isle of Man. It chiefly inhabits rocky ground, and oyster and scallop banks, adhering to shells, living in various depths of water from fifteen to as deep as eighty fathoms, and extending its range to considerable distances from land. It is finest in from fifteen to twenty-five fathoms, and usually small in very deep water.

It ranges from the coast of Norway to the Mediterranean, and as a fossil dates its existence within our area from the epoch of the coralline crag.

## SPURIOUS.

### P. MILITARIS, Linnæus.

LISTER, Hist. Conch. pl. 544, f. 11.

*Patella militaris*, LINN. Mantissa, p. 552 (probably).—PULTENEY, Hutchins, Hist. Dorset, p. 51.—MONT. Test. Brit. vol. ii. p. 488, pl. 13, f. 11.—DONOV. Brit. Shells, vol. v. pl. 171.—MAT. and RACK. Trans. Lin. Soc. vol. viii. p. 231.—RACK.

Dorset Catalog. p. 58, pl. 22, f. 7.—TURT. Conch. Diction. p. 140.—DILLW. Recent Shells, vol. ii. p. 1035.—WOOD, Index Test. pl. 37, fig. 42.

*Small Fool's-cap*, HUMPHREYS and DA COSTA, Nat. H. Shells, pl. 4, f. 10.

*Patella spirata*, HELBLING, Abhand. Privat. Bohmen, vol. iv. (1779) pl. 1, f. 1, 2.

*Pileopsis intorta*, LAM. Anim. s. Vert. (ed. Desh.) vol. vii. p. 610.—DESH. Enc. Méth. vol. ii. pl. 1, p. 154. — POTIEZ and MICH. Galerie Douai, vol. i. pl. 36, f. 9, 10.—HANL. Conch. Book of Spec. p. 12, f. 13.—DELESSERT Rec. Coquilles, pl. 25, f. 1.

*Capulus militaris*, Fleming, Brit. Animals, p. 364.

„ *intortus*, BLAINV. Malac. pl. 49 bis, f. 1.

*Pileopsis militaris*, Brit. Marine Conch. p. 135.—PHILIPPI, Moll. Sicil. vol. ii. p. 92 (probably).

*A West Indian shell; introduced by Pulteney as a Dorset species.*

## P. ANTIQUATA, Linnæus.

LISTER, Hist. Conch. pl. 544, f. 31.—KLEIN, Ostrac. pl. 8, f. 11, 12.

*Patella antiquata*, LINN. Syst. Nat. ed. 12, p. 1259. — PULTENEY, Hutchins, Hist. Dorset, p. 51.—MONT. Test. Brit. p. 485, pl. 13, f. 9.—TURT. Conch. Diction. p. 39.—DILLW. Recent Shells, vol. ii. p. 1035.

*Lepas*, &c., MARTINI, Conch. Cab. vol. i. p. 146, pl. 12, f. 111, 112.

*The Cap*, HUMPHR. and DA COS. Nat. Hist. Shells, pl. 4, f. 6.

*Patella mitrula*, GMEL. Syst. Nat. p. 3708.—MAT. and RACK. Trans. Linn. Soc. vol. viii. p. 230.—RACK. Dorset Catalog. p. 58, pl. 22, f. 7, a.

*Capulus antiquatus*, FLEMING, Brit. Animals, p. 364.—Brit. Marine Conch. p. 135.—MACLAURIN, Berwick Club, vol. ii. p. 40.

*Pileopsis mitrula*, LAM. Anim. s. vert. (ed. Desh.) vol. vii. p. 610.—GRAY, Encyclop. Metropolitana, Moll. pl. 4, f. 13, 14. — DESH. Encyc. Méthod. Vers, vol. ii. pt. 1, p. 154.

*Hipponyx mitrula*, Proc. Zoolog. Soc. 1835, p. 5 (probably).

*A native of the West Indies; introduced by Dr. Pulteney as from the shores of Dorsetshire.*

## CALYPTRÆA, Lamarck.

Shell conical, entire, depressed, subspiral, with a central vertex; surface smooth, or scaly; interior with a partition.

Animal with a broad and slightly produced muzzle; tentacula two, rather short, lanceolate, unconnected, with the eyes on bulgings at their external bases; mantle with a simple edge: branchial plume single; foot suborbicular, slightly angled in front, its sides plain. Tongue constituted like that of *Pileopsis* (?)

This is a southern and tropical genus, of which the only species inhabiting our seas is one on the very bounds of the region inhabited by the tribe. In tropical seas the forms of *Calyptræa* are very curious and varied. Unlike *Pileopsis*, the group is of comparatively recent origin, beginning, at earliest, during the later secondary epoch, and multiplying as it approached the present era.

### C. Sinensis, Linnæus.

Plate LX. fig. 3, 4, 5, and (Animal) Plate B.B, fig, 8 to 13.

Humph. and Da Cos. N. H. Shells, pl. 6, f. 11, 12.—Born, Testac. Mus. Cæs. Vind. p. 414, vign. fig. *c*.

*Patella Chinensis*, Linn. Syst. Nat. ed. 12, p. 1257. — Mont. Test. Brit. vol. ii. p. 489, pl. 13, f. 4. — Maton and Rack. Trans. Linn. Soc. vol. viii. p. 228.—Turt. Conch. Diction. p. 134, f. 29, 30.

„ *albida*, Donovan, Brit. Shells, vol. iv. pl. 129.

„ *Sinensis*, Dillw. Recent Shells, vol. ii. p. 1017.—Wood, Index Testac. pl. 37, f. 4.

*Calyptræa lævigata*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 623.

*Trochita Chinensis*, Schumacher, Syst. Vers, Testac. (1817), p. 184.

*Calyptræa Chinensis*, Fleming, Brit. Animals, p. 362. — Brit. Marine Conch. p. 136. — S. Wood, Crag Mollusca (fossil), pl. 18, f. 1, a—e.

*Calyptræa Sinensis*, Desh. Ann. Sc. Nat. vol. iii. (1824), p. 335, pl. 17, f. 1, 2; Encycl. Méth. vol. ii. p. 175.—Brown, Illust. Conch. G. B. p. 60, pl. 20, f. 16, 18.
*Patella muricata*, Costa, Moll. Sicil. p. 124.
„ *vulgaris*, Philippi, Moll. Sicil. vol. i. p. 119, and vol. ii. p. 93.
*Infundibulum rectum* (fossil), J. Sowerby, Min. Conch. pl. 97, fig. 3.
„ *Sinense* (fossil), Morris, Cat. Brit. Fos. p. 148.

This delicate shell is thin, semi-transparent, and of an uniform white both within and without. It is nearly circular at the base, is depressed-subconical, and has the vertex nearly central, tapering to a small point, and rapidly subspiral. The outer surface is rather dull, and either almost smooth, or closely set with small very thin and caducous vaulted scales, which latter is probably the normal state, and the frequent smoothness the mere result of abrasion. No other sculpture is obvious, but the lines of growth are often strongly indicated. The interior is highly polished, and has the margin perfectly entire; there is a remarkably fragile broad septum, which runs obliquely and spirally from under the vertex, so as to cover over about one fourth of the area of the lower disc. This septum, which is more or less concave, and only marked with the lines of growth, is attached to the side of its arcuated outer edge, and is free and much incurved at its inner edge, which latter is strengthened by a more copious deposition of shelly matter, and forms a kind of pseudo-columella: the terminal edge of it is convex, and very nearly reaches to the basal level. The diameter of the base rarely exceeds three quarters of an inch.

The animal is yellowish, or fawn white, with opaque dots. The head is not very prominent, and is short, terminating in a cleft or bilobed muzzle. On each side of it is a thick cylindric rather short tentacle, bearing the eye on a bulging near the outer base. There is a slightly developed semicircular, plain-edged, fleshy lobe on each side of the neck. The mantle is single-edged, without any trace of a fringe, and broader at one side than at the other. In the cavity behind the head is seen the pectinated branchial plume, the divisions of which are long, linear, and rounded at their ends. The foot is circular, with slightly produced angles on each side in front. The tongue is rather broad and colourless.

This Mollusk lays its spawn on stones and old shells. The spawn is enveloped in bundles of fimbriated colourless membrane, the edges of which appear white or yellow owing to the included genus. The fry have a helicoid shell, rather large eyes on the bases of short triangular tentacles, and large ciliated neck lobes. Mr. Alder has observed the *Calyptræa* to carry and hatch its spawn under the neck in front of the foot, and a similar habit has been noticed by Mr. Clark in *Pileopsis Hungaricus*. A *Calyptræa*, which we kept in confinement, swallowed a *Goniodoris nodosa* preserved in the same vessel.

This is essentially a southern British shell. It is abundant in Jersey (S. H.) and Guernsey (Barlee); we have taken it in Dartmouth reach in seven fathom water (M'Andrew, and E. F.); Plymouth (Jeffreys); Salcombe (Alder, Barlee); Falmouth (Cocks); Fowey (Peach, Alder); Milford Haven in ten fathoms, apparently its northernmost limit on the English coast (M'Andrew); "on the east coast of Ireland" (Thompson).

It does not range north of Britain, but southwards extends to the Mediterranean. As a fossil it dates back to the coralline crag.

## SPURIOUS.

### Crepidula unguiformis, Lamarck.

*Patella crepidula*, Linnæus, Syst. Nat. ed. 12, p. 1257.
*Crepidula unguiformis*, Lam. Anim. s. Vert. (ed. Desh.) vol. vii. p. 642 (probably).—Sowerby, Genera Shells, Crep. f. 6.—Philippi, Moll. Sicil. vol. i. p. 94.—Brod. Proc. Zool. Soc. 1834, p. 39; Trans. Zool. Soc. vol. i. pl. 29, f. 4. —Reeve, Conch. Syst. pl. 143, f. 6.
,, *plana*, Say, American Conch. pl. 44.—Gould, Invert. Massach. p. 158, f. 16.—Dekay, New York Fauna, Moll. p. 158, pl. 7, f. 153.
*sinuosa*, Turt. Zool. Journ. vol. ii. p. 364, pl. 13, fig. 5.—Fleming, Brit. Animals, p. 363.
,, *candida*, Risso, Hist. Nat. Europe Mér. p. 255, f. 138.
,, *calceolina*, Deshayes, Encycl. Méth. Vers, vol. ii. pt. 2, p. 26.
,, *Protea*, *var.* D'Orbigny, Voy. Amer. Mérid. p. 465.

*A native of North America; introduced into our Fauna by Turton, from having been found at Scarborough attached to the bottom of an American vessel. It is precisely the* plana *of Say, from which the* unguiformis *of the Mediterranean does not seem essentially distinct: the latter is the* Patella crepidula *of the Linnæan cabinet.*

# FISSURELLIDÆ.

The passage from the Limpets to completely spiral univalves, is very naturally maintained by the members of this family, all of which are remarkable for some solution of continuity in the shell, either a perforation or a slit in the region of the vent, and with reference to the construction of that organ, though often spoken of by conchological writers as if it were a branchial orifice. The form of their shells is more or less conical, with indications of a rudimentary spire at the apex, which often disappears with advancing age. The animals have well developed heads, with short muzzles, and subulate tentacles, at the external bases of which are the eyes placed on rudimentary pedicles. Between the sides of the foot at the mantle is a range of short lateral cirrhi. These characters of peduncated eyes and cirrhated sides indicate a close approach to the *Trochidæ* and *Haliotideæ*, an indication of affinity which is fully borne out by the arrangement of the lingual teeth. There are two symmetrical branchial plumes.

The genera are distinguished from each other by the characters of the mantle and the disposition of the vent, both of which affect materially the form and characters of the shell, consequently the family is composed of groups equally well defined, conchologically and malacologically. All its members are marine, some littoral, some inhabiting considerable depths. They are distributed through the seas of all climates.

## FISSURELLA, Bruguiere.

Shell conical, usually thick and depressed, the vertex of the adult truncate and perforate, and placed on the shorter, which is the anterior portion of the shell ; aperture widely expanded, oblong ; surface with radiating, often cancellated, striæ or ribs. Interior without any partition ; muscular impression elongate, crescentic, interrupted in the region of the head.

Animal with a short muzzle, terminating a tumid head, bearing two subulate tentacles, at the external bases of which are the eyes, placed on rudimentary pedicles ; a range of numerous cirrhi around the sides at the base of the very large foot ; mantle produced in front, with a fringe of cirrhi above its margin ; anal siphon in the form of a short, truncated, membranous canal, projecting from the apical aperture of the shell ; branchial plumes two.

The fry of this genus has the vertex of the shell entire and subspiral ; the perforation at that stage assumes the position which we see it permanently take in *Rimula* and *Puncturella*. The species of *Fissurella* are numerous, often large and handsome, and mostly inhabitants of tropical seas. But few are known in the fossil state. The majority of living ones inhabit shallow water. They are popularly known as Key-hole Limpets, on account of the peculiar shape of the apical orifice.

### F. reticulata, Donovan.

Plate LXIII. fig. 4, 5, and (Animal) Plate B.B. fig. 7.

*Patella Græca*, Pennant, Brit. Zool. ed. 4, vol. iv. p. 144, pl. 89, f. 153.—Pulteney, Hutchins, Hist. Dorset, p. 52.—Mont. Test Brit. vol. ii. p. 492.—Maton and Rack. Trans. Linn. Soc. vol. viii. p. 236.—Rack. Dorset Catalog. p. 59, pl. 23, f. 3.—Turt. Conch. Diction. p. 141, f. 82 (badly).—Donov. in Rees' Encycl. (1811) Conch. pl. i. bis?.—Brookes, Introd. Conch. f. 123.—Dillw. Recent Shells, vol. ii. p. 1056 (chiefly).—Wood, Index Test. pl. 38, f. 91.
„ *larva reticulata*, Da Costa, Brit. Conch. p. 14, pl. 1, f. 3.
„ *reticulata*, Donov. Brit. Shells, vol. i. pl. 21, f. 3.
„ *apertura*, (Fry) Mont. Test. Brit. p. 491, pl. 13, f. 10.—Maton and Rack. Trans. Linn. Soc. vol. viii. p. 236.—Turt. Conch. Diction. p. 141, f. 82.—Lowe, Zool. Journ. vol. iii. p. 77.
*Fissurella cancellata*, Gray, Annals Philosoph. 1825.
„ *Græca*, Fleming, (not Lam. nor Desh. in Enc. Méth.) Brit. Anim. p. 364.—Forbes, Malac. Monens. p. 34 (animal).—Brit. Mar. Conch. p. 134.—Brown, Ill. Conch. G. B. p. 61, pl. 12, f. 10, 11.—Philippi, Moll. Sicil. vol. i. p. 116, and vol. ii. p. 90.
„ *apertura*, (Fry) Fleming, Brit. Anim. p. 364.
„ *Europæa*, Sowerby, Conch. Illust. Fissurella, p. 5, f. 43.
„ *reticulata*, Récluz, Revue Zoolog. Cuvierenne, 1843, p. 110.—Hanley, Brit. Mar. Conch. p. xxxii.
*Sipho radiata*, (Young) Brown, Illust. Conch. G. B. p. 61, pl. 12, f. 20.

As the specific epithet *Græca*, by which this shell has usually been designated by British writers, more properly belongs to an allied Mediterranean species (*neglecta*) figured by Tournefort, we have followed M. Recluz in the adoption of the name bestowed by Donovan. The *Græca* of Lamarck (not of Linnæus) is again different, and is a native of the West Indian islands.

The shape is depressed subconical, and the basal outline is oblong or elongated elliptical, a little narrower in front, but well-rounded at both extremities; the lateral edges are not contracted, but are slightly or moderately convex. From a disposition to spread at the margin, the side surfaces are rather flattish or even a little concave; so too is the anterior superficies, the hinder one is tolerably arched. The shell is strong, opaque, and devoid of lustre. On a ground of white, which is rarely pure, often is squalid, and not unfrequently is tinged with green or ochre colour, from about five to eight rather irregular rays, sometimes broken into more or less confluent spots, may be observed: these are dark grey, brownish grey, olivaceous or even dirty green; the colouring, in truth, is by no means brilliant. The sculpture demands particular attention, since, unless due regard be paid to its peculiarities, the species will inevitably be confused with some of its many allied exotic congeners. A reticulation is effected by the decussation of very numerous radiating costellæ, and frequent concentric elevated lines. The former are rather strongly elevated, not much rounded, alternately slightly larger and smaller, closely disposed (we have counted fifty upon a specimen not an inch long), yet always with a distinct but very narrow interstitial space; the latter are much less coarse and prominent, are moderately far apart, and become somewhat lamellar, or even a little squamular (not nodose), at the intersection.* The vertex is before the middle of the shell, but is not marginal; in the very young it is fine and subspiral (at this stage the foramen precedes it), but soon becomes worn off, and the summit is then occupied by a rather small simple oblong perforation, of which the internal ring or border is tolerably broad, not different in colour from the general white hue of the interior, and is sometimes rounded, but more often subtruncated, anteriorly. The basal margin is strongly dentated, and the teeth are so arranged that many of them appear bifid. Few examples exceed an inch in length.

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* In *Patella Græca* of Linnæus, the ribs and concentric lines are much more closely disposed; in *Fissurella Græca* of Lamarck, the clathration is much coarser, and nodulous at the intersection.

Animal bulky, varying in colour from tawny and creamy white, through various shades of yellow to a rich orange approaching scarlet, in the latter case only in such specimens as are taken from the surface of scallops incrusted with crimson sponge. The head is placed beneath the shorter end of the shell; it is tumid with a rather prominent muzzle, and bears two stout subulate tentacles, but capable of considerable elongation; at their external bases are very short pedicles bearing rather small eyes. The mantle is very wide-margined, extending beyond the edges of the shell; above the head it is produced so as to form an expanded hood or veil; its edges are scalloped, and bear on their upper surface, immediately under the margin of the shell, a circle of very small and short but stout cirrhi, corresponding to the ribs. The foot is very large, expanded, ovate, and broad-sided. At its junction with the body there is a row of short cirrhi, more than thirty in number in a specimen of average size, and usually alternately larger and smaller; the cirrhus next the head is rather longer than the others. Above the line of cirrhi the sides are paler coloured than below. The anal tube is of a brownish white colour and has simple margins.

This Mollusk is western and southern in its range, extending from the English Channel, round by the Irish Sea and west coast of Ireland, to the Hebrides, and thence to the Orkneys. We are not aware of its having been taken in the German Ocean northwards of the Kentish coast. It is found usually adhering to shells, and ranges from the laminarian zone to as deep as fifty fathoms. The following localities will illustrate its range: Herm (S. H.); Margate (S. H.), in fifteen to twenty fathoms; west bay of Portland (M'Andrew and E. F.); Exmouth (Clark); Falmouth (Cocks); bays, near Swansea and Torbay (Jeffreys); in twelve fathoms Milford Haven, and in twenty-five fathoms Anglesea (M'Andrew and E. F.); around the Isle of Man in from twelve to twenty-five fathoms (E. F.); Clyde (Smith); Loch Fyne, Oban, and Stornoway (Barlee); cast on the shores of Sanda and Stronza, Orkney (Thomas). Among Irish localities may be mentioned Birterbuy Bay (Barlee); Clew Bay, in from three to ten fathoms (Ball, Thompson, and E. F.); Bantry (Jeffreys); and in fifty fathoms, but dead, on the Nymph Bank (M'Andrew).

It does not appear to range northwards in Britain; southwards it extends to the Mediterranean. As a fossil it dates with certainty from the epoch of the coralline crag.

## SPURIOUS.

### F. NUBECULA, Linnæus.

*Patella nubecula*, LINN. Syst. Nat. ed. 12, p. 1262 (from type). — TURT. Couch. Diction. p. 142, f. 81 (from type). — DILLW. Recent Shells, vol. ii. p. 1061.
*Fissurella rosea*, SOWERBY, Conch. Ill. Fissur. f. 8? — PHILIPPI, Moll. Sicil. vol. ii. p. 91.
„ *nubecula*, FLEMING, Brit. Animals, p. 365.
„ *nimbosa*, PHILIPPI, Moll. Sicil. vol. i. p. 117.

*A Mediterranean shell; introduced by Turton as* said *to have been dredged off the Cornish coast. Whether the* F. nubecula *of Macgillivray (Moll. Aberd. p.* 345, *from which Brit. Marine Conch. p.* 251) *is identical we cannot say (not having seen his specimen), but the fifteen broad ribs ascribed to it, are neither present in Turton's example nor in those sent us by Dr. Philippi.*

## PUNCTURELLA, Lowe.

Shell conical, with an elevated slightly recurved obliquely subspiral entire vertex, turned towards the posterior end; aperture expanded, oval; surface with radiating ribs; margin entire; a linear perforation in the upper part of the shell, between the vertex and frontal margin, in the line of an elevated rib. Interior with a linear groove corresponding to the perforation and frontal rib, vaulted over in its upper part by a shelly plate. Muscular impression crescentic, with slightly-incurved extremities, interrupted in the region of the head.

Animal with a short muzzle-shaped head, bearing two subulate tentacles, which have the eyes placed on prominent bulgings, or rudimentary pedicles, at their external bases; a range of cirrhi interrupted behind on each side; mantle simple-edged; anal siphon very prominent, forming a truncated membranous canal projecting from the subapical perforation; branchial plumes two.

The curious shell from which this genus is founded, rejoices in three if not four appellations, devoted entirely to itself: we adopt that which was given it with a full understanding of its claims to generic distinction by a naturalist whose every labour among the Mollusca is so excellent, that we could wish his published researches were much more numerous than they are. The synonyms, CEMORIA and SYPHO, cited in nomenclature catalogues as of prior date, were neither of them published with generic diagnoses, and, moreover, seem to have been suggested to their authors by the fry of the *Fissurella Græca*. Lovèn refers the following shell to the RIMULA of Defrance (founded for certain fossils, and of which recent species have been found by Mr. Cuming), but not correctly, for in the shells of that genus there is no internal partition.

### P. NOACHINA, Linnæus.

Plate LXII. fig. 10, 11, 12, and (Animal) Plate B.B. fig. 4, 5, 6.

*Patella Noachina*, LINN. Mantissa, p. 551.—CHEMN. Conch. Cab. vol. xi. p. 186, pl. 197, f. 1927, 1928.—DILLW. Recent Shells, vol. ii. p. 1055.
„ *fissurella*, MÜLLER, Zool. Danic. pl. 24, f. 5, 6.—O FABRIC. Fauna Grœnland. p. 384.—GMELIN, Syst. Nat. p. 3728.—DONOV. in Rees' Cyclop. Conch. pl. 1, bis (1811). ?
*Fissurella Noachina*, SCHUMACHER, Syst. Vers, Testac. (1817) p. 181.—Brit. Marine Conch. p. 134, f. 178.—SOWERBY, Conch. Illustr. Fissurella, p. 5, f. 15.—DESH. Lam. Anim. s. Vert. vol. vii. p. 604.
*Puncturella Noachina*, LOWE, Zoolog. Journ. vol. iii. p. 78 (Jan. 1827).—ALDER, Cat. Moll. Northumb. and Durh. p. 70.
*Cemoria Flemingii*, LEACH (MSS. quoted by Lowe, Zool. Journ. vol. iii.).—SOWERBY, Conch. Manual, p. 244.
„ *Noachina*, GOULD, Invert. Massach. p. 156, f. 18.—DEKAY, New York Fauna, Moll. p. 156, pl. 9, f. 195.—SEARLES WOOD, Crag Mollusca, p. 166, pl. 18, fig. 5 (fossil).
*Rimula Flemingii*, MACGIL. Moll. Aberdeenshire, p. 178.
„ *Noachina*, COUTHOUY, Boston Journ. N. H. vol. ii. p. 87.—LOVÈN, Index Moll. Scandinav. p. 21.
*Sipho Noachina*, BROWN, Illust. Conch. G. B. p. 61, pl. 12, f. 14, 15, 16.

The *Patella Noachina* of Linnæus, first known to us as a fossil, is a conical, subpellucid, and not very strong shell, of an uniform white, both within and without, externally rather dull, internally lustrous. It is laterally compressed, yet a little inclined to spread at the base; the front slope is rather more abrupt than the hinder one, but both are straightish, the former inclining, however, to the convex, the latter to the concave. The vertex is either in the middle or slightly precedes it; it is recurved, acute, and minutely and laterally subspiral. Just before it is a longitudinal chink or crevice, which is not of equal breadth throughout, but tapers above, chiefly enlarges near its lower extremity, and then again slightly contracts; it never approaches the base of the shell, being distant from it, in the adult, at the least two-thirds of the length of the front area. It communicates with a small square-mouthed funnel-shaped chamber, whose walls are detached at the broader end, but are strengthened at their commencement by a transverse lamina of shelly matter. The margin or aperture of the shell is more or less oval, rounded at the extremities, and tolerably convex at the sides; it is crenately undulated by the external sculpture. This last consists of numerous radiating narrow costellæ, that are alternately larger and smaller, and are rendered rough, and, in the young, and toward the vertex of the adult, subgranular, by a fine and crowded concentric decussation.

One of our largest examples measures four lines in breadth, and rather exceeds five in length.

The animal is white. The head, which is tumid but short, bears two rather obtuse subulate stout tentacula, with the eyes, which are very large, on prominent bulgings, or short peduncles at their external bases. The mantle is simple-edged. The foot is oblong and not steep or high-sided; at its junction with the body there are, on each side, six or seven short cirrhi, and an odd one, larger than the rest, and behind them on the left side. There are no cirrhi posteriorly. From the anal cleft projects a conspicuous truncated sheath-like membrane, open in front, where there are three or more retractile papillæ. The branchiæ are distinctly visible in the cavity behind the head.

This very curious shell was first observed as a fossil by Linnæus himself, in the pleistocene beds of Sweden. Not until of late years has it been taken alive, and British cabinets were for a long time supplied with specimens from the pleistocene beds of the Clyde. Mr. Smith, of Jordan Hill, was the first to maintain its existence in the living state in the British seas. Except on the Northumberland coast, where it has been taken at Cullercoats, by Mr. Alder, and in fifty fathoms sixty miles to the east of the north coast of Durham, by Mr. King, its localities are all Scottish. It ranges in depth from twenty to one hundred fathoms, and occurs at intervals throughout the Hebrides, and off the coast of Zetland (M'Andrew, Jeffreys, E. F.). In from thirty to eighty fathoms on the west coast of Orkney; alive, on stones, in thirty-five fathoms, Buchanness, and in sixty fathoms, Troup Head (Thomas).

It is a species essentially of northern origin, and has now its chief habitats in arctic and boreal seas, extending along the coast of Greenland, and down those of Boreal America to Cape Cod. It dates its origin from the pleistocene epoch, and can only be regarded as a lingerer in our existing seas.

### EMARGINULA, Lamarck.

Shell conical, with an elevated slightly recurved entire vertex (obliquely subspiral in young specimens) turned towards the posterior end; aperture expanded oval; surface with radiating and cancellated striæ or ribs; emarginated in front by a slit which runs for some distance up the shell, and is continuous with a closed groove which reaches the apex; interior without a partition; muscular impression crescentic, with deeply incurved extremities, interrupted in the region of the head.

Animal with a short muzzle terminating a tumid head bearing two subulate tentacles with subpedunculated eyes at their external bases; a range of cirrhi around the sides at the base of the foot; mantle simple-edged; anal siphon with its angulated membranous sides projecting from the edges of the fissure; branchial plumes two. Tongue (according to Lovèn) with numerous transverse dental elements; its rachis composed of nine teeth, the central one laminar and subquadrate, the lateral teeth (*uncini*) very numerous.

Lovèn suggests that an isolated cirrhus which is present on the back of the foot in this genus (and which we have observed also in *Puncturella*) may be a rudimentary operculigerous lobe.

This is a genus of ancient appearance within our area, where species of it were present during the older secondary period, if not before. Those now living enjoy a great range in depth.

### E. RETICULATA, Sowerby.

Clathrated; vertex but little recurved in the adult, always falling within the basal circumference; fissure short and narrow.

Plate LXIII. fig. 1, as Mülleri.

LISTER, Hist. Conch. pl. 543, f. 28.

*Patella fissura*, LINN. Syst. Nat. ed. 12, p. 1261 (only in part and not well).—PENN. Brit. Zool. ed. 4, vol. iv. p. 144, pl. 90, f. 152.—DA COSTA, Brit. Conch. p. 11, pl. 1, f. 4.—PULTENEY, Hutchins, Hist. Dorset, p. 51.—DONOV. Brit. Shells, vol. i. pl. 3, f. 2.—MONT. Test. Brit. vol. ii. p. 490 (adult).—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 235 (in part).—RACK. Dorset Catalog. p. 59, pl. 23, f. 4.—TURT. Conch. Diction. p. 141.—MÜLLER, Zool. Dan. pl. 24, f. 7, 8.—BROOKES, Introd. Conch. f. 127.—DILLW. Recent Shells, vol. ii. p. 1054.—WOOD, Index Testac. pl. 38, f. 86.—MAWE, Linn. Conch. pl. 32, f. 1.

*Emarginula reticulata*, J. SOWERBY, Min. Conch. pl. 33, lower figs. (fossil).

„ *fissura*, FLEMING, (not Lam.) p. 365 (in part, not var.).—JOHNSTON, Berwick Club, vol. ii. p. 33.—MACGIL. Moll. Aberd. p. 178.—Brit. Mar. Conch. p. 133 (not var.).—BROWN, Illust. Conch. G. B. p. 62, pl. 12, f. 17, 19.—POTIEZ and MICH. Gal. Douai, Moll. p. 519, pl. 36, f. 15, 16.

*Emarginula lævis*, RÉCLUZ, Revue Zoolog. Cuvierienne, 1843, p. 232.

„ *curvirostris* (YOUNG), MACGIL. (not Desh.) Moll. Aberdeens. p. 331.

The collection of Linnæus having confirmed the decision arrived at by M. Recluz solely from a critical perusal of the "Systema Naturæ," that this is not the *Patella fissura* of the author of that work, we are compelled to find another name for this well-known shell. The specific epithet *lævis* must be rejected, since, besides its incorrectness, it was applied through an erroneous impression that this was the *Patella lævis* of Pennant.

When adult this shell is conical, strong, and opaque, with the vertex simply and slightly recurved, and not even hooked: when young the texture is thin and semitransparent, the shape much more depressed, and the vertex acute, much curved, and almost obliquely subspiral; in all stages, however, a line let fall from the vertex would fall within the margin. The shell, which exhibits a slight lateral compression, the side surfaces being but little convex, is both within and without of a more or less clear white; the front dorsal outline is only moderately arched. The base, which is oval or elliptical, is rounded, and of nearly equal breadth at both extremities, and slightly or else moderately convex at the sides, but usually bulges out a little at the hinder part of the left one. The marginal slit, which is long, very narrow, slightly oblique, and as broad above as below, reaches to about two-fifths of the direct (not the superficial) height, but rather exceeds that proportion in the young, rather falls below it in the adult. Its previous course is indicated externally by a simple sulcus, that merely exhibits fine and closely set concentric striæ, instead of the general sculpture. This last consists of a clathration produced by the intersection of rather prominent narrow ribs, and almost equally strong concentric elevated lines; the hollows are profound, and of a squarish form. The basal margin exhibits indentations corresponding to the ribs. Five lines in length, and four in breadth and height, may be considered the full dimensions of this *Emarginula*.

The animal is white, and closely resembles in all its features that of the succeeding species, but the foot is never so bulky.

This species is generally distributed around our shores, and is especially abundant in the North and in the Irish Sea. It inhabits shell banks and clear ground in from near low-water-mark to as deep as ninety fathoms, abounding most in from twelve to twenty fathoms. It is found all along the western shores of Europe.

### E. ROSEA, Bell.

Ribs subgranose or somewhat geniculated; vertex greatly recurved, on a level with, or extending beyond, the posterior margin; interior occasionally tinged with rose-colour.

Plate LXIII. fig. 3.

*Lepas, &c.* MARTINI, Conch. Cab. vol. i. p. 145, pl. 12, f. 109, 110 (probably).
? *Patella fissura* (YOUNG), MONT. Test. Brit. vol. ii. p. 491.
*Emarginula conica*, SCHUMACHER, Syst. Vers, Testac. (1817), p. 181 (no description; solely from Martini's figure).
,, *rosea*, BELL, Zoolog. Journ. vol. i. (1824), p. 52, pl. 4, f. 1; Annals Philos. 1825, p. 388.—HANL. Brit. Marine Conch. p. xxxii.—BROWN, Ill. Conch. G. B. p. 62, pl. 12, f. 21, 22.—RÉCLUZ, Revue Zool. Cuvierienne, 1843, p. 234.
,, *pileolus*, MICHAUD, Bulletin Linn. Soc. Bordeaux, vol. iii. (1829), p. 171, f. 23, 24, teste PHILIPPI, Moll. Sicil. vol. ii. p. 89.
,, *capuliformis*, PHILIPPI, Moll. Sicil. vol. i. p. 116, pl. 7, f. 12.

The beautiful rosy hue of the aperture, from which this species has derived its name, must, we fear, be considered exceptional, rather than otherwise, since, in the majority of individuals, the shell is of a squalid white both within and without. Its shape is more or less conical, but with the front dorsal outline very strongly arched, and the vertex greatly recurved, so that a line dropped from the most projecting posterior portion of it would fall beyond the basal margin. The sides of the shell, which is tolerably strong for its size, devoid of lustre, and nearly opaque, are somewhat compressed; the base is oval or rounded oval, slightly or but moderately convex at the sides, arched at both extremities, and a little reflected posteriorly. Behind the vertex, which is hooked and subspiral, the outline is much incurved, and the declination is very abrupt. The marginal slit is narrow, and of equal breadth throughout; although nearly as high as in the preceding species, it is much shorter in proportion to the distance from its termination to the extreme point of the vertex. The sculpture, at first sight, bears much resemblance (especially in worn specimens) to that of *reticulata*, but in characteristic and uninjured examples, the longitudinal ribs are distinctly seen to be closer set, larger in proportion to the interstitial spaces, and subgranose, or rather subgeniculated, the concentric lines to be less prominent and very oblique, and the profound hollows to be on a smaller scale. The ordinary length is not above the fifth of an inch.

Animal white. The head projects immediately in front of the fissure in the shell, and is rather short and small, with an oblong muzzle; the tentacula are rather long, but stout; at their external bases are distinct but short pedicles, bearing rather large eyes. The mantle does not project beyond the shell; its edges are scalloped, and in front it is emarginated on the region of the anal fissure, which is bordered on each side by an angulated projecting lobe. The foot is large, strong, and very steep-sided; at its junction with the body is a circle of about twenty rather distinct very short papillary cirrhi.

This species which, though closely approaching some varieties of the last, is probably very distinct, is, so far as we have seen, on our shores, mainly a southern form. It was first taken at Poole by Professor Bell. It occurs on the rocks at Herm (S. H.); Exmouth (Clark); in seven fathoms, Weymouth Bay; in fifteen fathoms west bay of Portland; and in twenty to twenty-five fathoms off Plymouth (M'Andrew and E. F.); Langland Bay near Swansea (Jeffreys); Fowey, Cornwall (Peach).

Mr. Dillwyn received a specimen from Montagu under the name of *fissura* (Jeffreys). Mr. Jeffreys and Mr. Barlee both mark its occurrence in the Hebrides, but though we have frequently met with very hooked varieties of the last species, we never saw a specimen there which appeared to be a true *rosea*.

It ranges to the Mediterranean, and the fossil shells designated *fissura* in the crag seem to us to belong to *rosea*.

### E. CRASSA, J. Sowerby.

Not clathrated; vertex subcentral; slit short.

Plate LXIII. fig. 2, and (Animal) Plate CC. fig. 2.

*Emarginula crassa*, J. SOWERBY, Min. Conch. pl. 33 (fossil).—FORBES, Annals Nat. Hist. vol. xiv. p. 410, pl. 10, f. 1.—THOMPSON, Annals Nat. Hist. vol. xviii. p. 384.—LOVÈN, Moll. Scandinav. p. 20.—NYST, Coq. foss. Belg. p. 352, pl. 36, f. 3 (fossil).—SEARLES WOOD, Crag Mollusc. p. 165, pl. xviii. f. 2.

This magnificent species, the largest recent *Emarginula* at present known to us, has, until very lately, been solely observed in a fossil state.

It is white both within and without, rather solid and strong when adult, almost opaque, and of a more or less conical figure. The sides are slightly compressed, the front dorsal outline is moderately arcuated; the hinder dorsal outline is concave above, straightish below, and by no means abruptly sloping. The base is elliptical, or oboval, nearly equally rounded at both extremities, and moderately convex at the sides; the broader it is, the more arcuated are the side-margins, and the less elevated, and the less compressed is the shell. The vertex is acute and recurved, but not so posterior as in most of this genus; in the younger shells it is situated at about two-thirds the distance from the anterior extremity, in the adult it is very much more central. The slit which is of equal breadth throughout, and rather broad in proportion to its length, extends but a little space from the margin, being in general as three to fourteen; its proportion to the length of the base is very small; its previous course is indicated, as usual, by arcuated concentric striæ. The sculpture is on a small scale for the size of the specimens, and consists of an immense number of slightly elevated radiating striæ, generally grouped by threes and fours, upon the larger examples, in the form of depressed costellæ, that as well as the very narrow interstices are decussated, and rendered slightly granose, by very crowded coarse wavy concentric wrinkles. The peculiarly close and depressed nature of this decussation is remarkable; the hollows between the intersection are extremely small and shallow; indeed, towards the base, where the interstices (always small) become more and more diminished in size by finer intermediate radiating striæ, and the closer approximation of the concentric wrinkles, they are merely point-like indentations. The basal margin exhibits crenæ corresponding to the sculpture of the exterior. Our largest example measures fourteen lines in length, and at least ten in breadth.

The animal, of which a drawing has been communicated to us by Mr. Alder, is white. The tentacula are thick and cylindrical, and the eyes appear to be less, in proportion, than in our other species. The sides of the foot are narrow, and at their junction with the body there are above thirty short somewhat unequal cirrhi. The margin of the mantle is rather thick.

This rare shell was known as a fossil in the coralline and red crags of England and Belgium, and in the pleistocene of Norway before it had been discovered alive. In our seas it was first announced as British by Mr. M'Andrew, and is one of the most precious and beautiful of recent additions to our Fauna. It has been dredged in twenty-five fathoms in Loch Fyne (M'Andrew); in Loch Carron, off Skye, and at Oban (Jeffreys). In the last mentioned locality it was also taken by Mr. Alder. It has been taken in all these localities, and in Loch Long by Mr. Barlee. On the Irish coast it has been taken at the entrance of Belfast Bay in twenty fathoms by Mr. Hyndman and Mr. Getty, and specimens have been sold in Dublin as taken from the Irish bank. It has recently been procured somewhere between the coasts of Wales and Ireland.

It inhabits the Norwegian seas.

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In concluding our account of the limpets, we think it advisable to mention, that neither the *Patella orbiculata* of Turton's (Conchological Dictionary, p. 135), nor the *P. extinctorium*, and *P. tricornis* of the same work, belong to the Mollusca; the two latter are opercula of Annelides.

## HALIOTIDÆ.

The *ear-shells* constitute a very natural passage from the Patelliform Mollusks to the *Trochus* tribe, combining in both animal and shell many of the features of the latter family with some of the peculiarities of the *Fissurellidæ*. Milne Edwards [*] has described some remarkable arrangements of the circulatory system common to *Haliotis* and *Patella*, whilst the dental system of the former genus strikingly reminds us of *Trochus*, as do the pedunculated eyes, lobed head-veil, and cirrhated side-lobes. There are two branchial plumes. The shell is greatly expanded and furnished with a short and small spire; in most cases it is either notched or perforated at intervals, in this respect approaching *Emarginula* and its allies. The typical genus *Haliotis*, though one of great extent in tropical and southern regions, where it includes numerous and gigantic species often of exquisite beauty, is included in the British Fauna rather by courtesy than by strict right, seeing that its range does not extend beyond the Channel Islands.

### HALIOTIS. LINNÆUS.

Shell ear-shaped, depressed, externally smooth or undulated or striated, internally nacreous; spire very short, and placed as if laterally; mouth very large, broader than long, entire-edged, a series of perforations forming an arc parallel with and near to its left margin, and continuous with the spiral crest of the convolutions.

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[*] Ann. des Sc. Nat., Series 3, vol. viii. p. 37.

Animal shaped like the shell, its head terminating in a short muzzle and bearing two subulate tentacles and two stout eye-peduncles at their external bases; a fimbriated lobe between the tentacula apparently continuous with the fimbriated and cirrhated lateral lobes of the body; lateral cirrhi numerous. Foot very large, oblong, rounded at the extremities, bearing on its upper extremity a rudimentary operculigerous lobe, but no operculum. Branchial plumes two. Dental system of a median tooth flanked by two laterals, four primary accessorials, and numerous secondaries.

This genus is littoral in its habits. It is characteristic of the present epoch, and as a fossil is only known in the later tertiaries. It occurs in the miocene beds of Malta, but no species is found fossil in British formations.

### H. TUBERCULATA, Linnæus.

Plate LXIV. and (Animal) Plate C.C. fig. 3.

LISTER, Anim. Angl. pl. 3, f. 16.—REGENF. pl. 10, f. 42.

*Haliotis tuberculata*, LINN. Syst. Nat. ed. 12, p. 1256.—PENN. Brit. Zool. ed. 4, vol. iv. p. 141, pl. 88.—PULTENEY, Hutchins, Hist. Dorset, p. 50. — DONOV. Brit. Shells, vol. i. pl. 5. — MONT. Test. Brit. p. 474. — MATON and RACK. Trans. Linn. Soc. vol. viii. p. 227. — RACKETT, Dorset Catalog. p. 57, pl. 22, f. 1, 2. — FLEMING, Brit. Anim. p. 362. — Brit. Marine Conch. p. 155.—BROWN, Illust. Conch. G. B. p. 23, pl. 12, f. 2, 18.—DONOV. in Rees, Cyclop. Conch. pl. 6, (1808). —DILLW. Recent Shells, vol. ii. p. 1009.—WOOD, Index Testac. pl. 36, f. 4. — LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 26. — DESH. Encyclop. Méthod. Vers, vol. ii. pt. 2, p. 179.—D'ORBIGNY, Moll. Canar. p. 95, pl. 7, f. 1, animal (probably).—PHILIPPI, Moll. Sicil. vol. i. p. 165; vol. ii. p. 142. — HANL. Young Conch. p. 59. —REEVE, Conch. Iconica, vol. iii. Haliot. pl. 11, f. 34.

*Auris marina &c.* Martini, Conch. Cab. vol. i. pp. 187, 188, pl. 16, f. 148, 149.
*Haliotis vulgaris,* Da Costa, Brit. Conch. p. 15, pl. 2, f. 1, 2.

The colouring of this shell, which is not much swollen, and whose shape is oval, or oboval, is peculiarly variable, scarcely any two specimens being precisely alike. The component colours of its painting are green and red, with an occasional mottling of white. The green is generally bluish or olivaceous, the red ranges from purplish to brownish rufous, but is more frequently of a brick colour: these hues either shade into each other, or angulated patches or cloudy markings of the darker tint adorn the paler one. The exterior in some individuals is flatly costellated, the intervals of the ribs being almost linear; plano-convex unequal costellæ, whose interstices are about as broad as the finer of them, cover the surface of other, and chiefly aged, examples; the sculpture in some, again, is so close and fine that the exterior is rather striato-sulcated than ribbed. Neither the raised nor the level portions of the surface can be termed cancellated, but most minute and densely disposed longitudinal striulæ are occasionally perceptible. There is usually a slight retusion of surface midway between the foraminal tubercles and the spire; the former are moderately prominent, and tolerably large; from six to eight are open; the perforations are in general oval or rounded oval. Beyond these is a rather broad and strongly indicated shallow channel, or excavated area, whose limit is well defined by a coarse rib, succeeded by other similar but less strong ones. Some wavy longitudinal folds are occasionally present, but the surface is more frequently only undulated at the stages of increase. The spire is remarkably small, the body or final volution being most abruptly enlarged; it is obliquely and moderately elevated; the apex is generally more or less prominent. The internal nacre is soft and silvery; it is iridescent, but does not sparkle with those rich and brilliant hues that adorn some of the exotic Ear-shells; neither is there any peculiar stain beneath the spire, only a single coil of which is visible from within. The outer lip is more or less arched; the inner lip, or pillar, is moderately broad, rather flattened, and not much attenuated at its termination. Our largest specimen measures three inches and three quarters in breadth, and two inches and a half across from side to side.

The animal is variously tinted with tints of brown, green, white, and salmon colour. The head and tentacula are brown, the eye-peduncles white, the eyes blue. The lateral cirrhi, which thickly fringe the side lobes, are greenish and brownish; the side-lobes themselves striped alternately with brown and greenish white. The sides of the foot are dark greenish brown; its disk, which is rounded at each extremity, of a salmon colour.

This handsome shell is an inhabitant of the very verge of the littoral zone, living near and under rocks and stones. It takes its place in the British Fauna solely on account of its presence in the Channel Islands, where it is abundant, and known by the name of *Ormer*. It is cooked for food, after being well beaten to render it tender. A more important use of it is in the making of the mother-of-pearl ornaments which constitute so much of the beauty of works in *papier maché*. Great quantities of *Haliotis* are brought to Birmingham for this purpose.

This *Haliotis* has at various times been published as an inhabitant of different parts of England and Ireland. There can be no question that the instances alluded to have been founded on some mistake, or on the circumstances of some stray specimen having found its way from its habitat on a chimney-piece to the cabinet of some over-zealous, but not discriminating, British collector. It ranges south of Britain as far as the Canaries.

# TROCHIDÆ.

The Top-shells constitute a numerous family, remarkable for exquisite beauty of form and colour, both of shell and animal. Some of our most elegant British univalves belong to this tribe, and many of the most ornamental exotic shells. Their animals have all pedunculated eyes; heads terminating in a muzzle, and often ornamented with head-lobes; side-lobes greatly developed, and ornamented with lappets and lateral cirrhi; a tail bearing a spiral operculum, sometimes horny, sometimes shelly; a single branchial plume, and a dental system remarkable for the number of accessory lateral denticles. The shells vary much in form, ornament, and structure, some being discoid, whilst others have greatly produced spires; though, in all, the spire forms a very considerable portion of the entire shell. Their orifices are entire, but vary much in outline.

In formations even of palæozoic age we find the shells of Mollusca of this family often resembling closely, in general outline, existing forms. The so-called *Euomphali*, *Cirrhi*, and the greater number of *Pleurotomariæ*, appear to have been allies of *Delphinula*, *Turbo*, and *Trochus*.

## TROCHUS.

Shell very variable in form, sculpture and strength, conical, subglobose or subdepressed, texture partly nacreous, spire of several whorls, aperture entire, usually angulated, sometimes nearly round; base perforate or imperforate.

Animal with a large head terminating in a short proboscis, and bearing two subulate tentacles, sometimes smooth, sometimes ciliated, and two strong separate eye-peduncles at their outer bases; between the tentacles are two more or less developed head-lobes, which, however, in some species are nearly obsolete; next the eye-peduncle, on each side, is a large lappet, continuous with greatly developed side-lobes, bearing usually three, sometimes four or five subulate cirrhi; foot more or less lanceolate or oblong, an operculigerous lobe on its upper surface posteriorly, bearing a many-spired, horny operculum. Gill very long, linear. Tongue rather long; each series of denticles composed of a central element flanked by five hooked lateral and numerous narrow accessorial teeth.

This extensive genus includes a great assemblage of beautiful Mollusks, in which colour, both of soft and hard parts, becomes an important character. Our British species may be divided under three well-marked, subgeneric sections:—

1. Trochus. Animal with the inter-tentacular lobes very slightly developed. Three lateral cirrhi on each side. Shell more or less pyramidal, imperforate; to this group belong *ziziphinus*, *conulus*, *alabastrum*, *granulatus*, *striatus*, *millegranus*, *exiguus*, and *Montacuti*.

2. Gibbula. Animal with largely developed inter-tentacular lobes. Three lateral cirrhi on each side. Shell tumidly conical, usually perforate—as *T. Magus*, *tumidus*, *cinerarius*, *umbilicatus*, and, though abnormally, *lineatus*.

3. Margarita. Cirrhi five on each side. Shell tumid, thin, usually perforate. *T. Helicinus*, *undulatus*, and *pusillus*.

### T. ZIZYPHINUS. Linnæus.

Conical, imperforated, either devoid of colour, or painted with longitudinal flames, and spotted upon the more or less prominent marginal belt; the spiral costellæ (when present), and their interstices, alike simple in the adult, except at the apex, which is not peculiarly stained with rose-colour.

Plate LXVII. figs. 1 to 6.

Lister, Anim. Angl. pl. 3, f. 14; Hist. Conch. pl. 616, f. 1.

*Trochus ziziphinus*, Linn. Syst. Nat. ed. 12, p. 1231.—Penn. Brit. Zool. ed. 4, vol. iv. p. 126, pl. 80, f. 103.—Pulteney, Hutchins, Hist. Dorset, p. 44.—Donov. Brit. Shells, vol. ii. pl. 52.—Mont. Test. Brit. p. 274.—Maton and Rack. Trans. Linn. Soc. vol. viii. p. 155.—Rack. Dorset Catalog. p. 48, pl. 16, f. 3, 4.—Fleming, Brit. Anim. p. 323.—Turt. Conch. Diction. p. 189.—Forbes, Malacol. Monens. p. 22 (animal).—Johnst. Berwick Club, vol. i. p. 263 (with animal).—Brit. Marine Conch. p. 163.—Dillw. Recent Shells, vol. ii. p. 799 (not var.)—Wood, Index Testac. pl. 29, f. 94.

,, *conulus*, Pennant, Brit. Zool. ed. 4, vol. iv. pl. 80, f. 104 (probably).

,, *zyziphinus*, Born, Testacea Mus. Cæs. Vind. p. 337.—Blainv. Faune Française, Moll. p. 258, pl. 10, f. 1.

,, *ziziphinus*, Da Costa, Brit. Conch. p. 37, pl. 3, f. 2.—Brown, Illust. Conch. G. B. p. 18, pl. 11, f. 16, 17, 18, 19, 21, 22, 24, 29.—Lam. Anim. s. Vert. (ed. Desh.) vol. ix. p. 142.

,, *zezyphinus*, Chemn. Conch. Cab. vol. v. p. 66, pl. 166, f. 1594.

,, *discrepans*, Brown, Mem. Werner. Soc. vol. ii. pt. ii. p. 519, pl. 24, f. 4; Ill. Conch. G. B. p. 19, pl. 11, f. 20, 23.

,, *conuloides*, Lam. Anim. s. Vert. (ed. Desh.) vol. ix. p. 142.—Macgil. Moll. Aberd. p. 132.—Blainv. Faune Franç. Moll. p. 259, pl. 10, f. 4.—Desh. Ency. Méth. Vers, vol. iii. p. 1076.

,, *Lyonsii*, Leach MSS. (cited by Fleming).

,, *albidus*, Wood, Index Test. Suppl. pl. 5, Troch. f. 14.

,, *Sisyphinus*, Macgil. Moll. Aberd. p. 131.

,, *Sedgwickii* (fossil), Sow.—Nyst. Coq. fos. de Belge, p. 380, pl. 35, f. 20.

From the derivation of the name of this species having been made the subject of much discussion, has arisen the great diversity of spelling discernible in our synonymy; Professor Macgillivray deduces it from the rolling stone of the legendary Sisyphus, and Chemnitz from the plant *zezypha*. The "ziziphino colore depictus" (painted like the fruit of the jujube) of Gualtier's description, was probably the immediate source of the specific appellation. This shell is subject to a peculiarly wide range of variation in form, sculpture, and colouring, yet always so far preserves the essential elements of its specific character as to render a well-defined division of it into two or more species almost an impossibility. Otherwise the small deep water variety from our Northern and Irish coasts, is so aberrant, as almost to warrant its separation from the normal form.

The shell is tolerably strong, opaque or nearly so, and more or less shining; the shape is always purely conical, but varies considerably in the relative proportions of height of spire and breadth of base; the lateral outlines are slightly concave. The painting consists of several wavy longitudinal blotches or flames of pinkish red, dark liver-colour, or ruddy flesh colour, on a ground of citron flesh-colour, or more rarely warm reddish brown, that frequently changes to a livid or bluish hue toward the summit of the spire. The ground tint is sometimes of a bluish-slate, and the entire shell at times is quite devoid of colour; oftentimes, too, the reddish stains are confined to the base of each volution, where they form a kind of subarticulated fillet (in one of our scarcer varieties this is of a vivid purple); rarely if ever do they extend further than the margin of the base. They are chiefly conspicuous upon the bluntly angulated basal circumference. The whorls are eight to ten in number, of not very rapid increase, much shelving, and rather flattened, or even subretuse; in the smooth variety they are more rounded; in the larger individuals of the common littoral form, they are occasionally a little retuse on the body and penult volutions. The apex is very small and acute, and near it, the narrow raised spiral fillets, that typically encircle the shell, are granular; elsewhere they are simple and round-topped (occasionally, however, as in the solid dark produced variety we have figured, the subsutural one exhibits, at intervals, an obscurely subgranose appearance); these costellar striæ are sometimes coarse, few, and rather distant, sometimes numerous, very fine, and not much elevated. The inferior one of each whorl which immediately precedes the well-defined suture, is always conspicuous for size or prominence, and is preserved even in the broad-based smooth variety, where the others are wholly or partially absent. These spiral lines become flatter upon the base of the shell, where they either become indistinct or transmuted into sulci. The fine and close-set wrinkles of increase are at times perceptible upon the more rugged individuals, and diverge, as it were, from the axis of the shell. The base is imperforated, and, except in the smoother specimens, but little convex; the shelve is generally moderate. The mouth is obliquely rhombic, and considerably broader than it is long; in general it occupies about two-fifths of the entire length of the shell, and about one half the basal diameter; no sculpture distinguishes it, beyond the traces of the external fillets. The outer lip is very acute; the pillar is oblique, more or less curved, broad, rounded yet appressed, and with its nacre often interrupted or notched at the base by the jutting into it of the white callus, which bounds it externally. Our finer specimens measure an inch and three-eighths both in length and breadth; but these dimensions, although greatly beyond the average, are by no means the extreme limit of the size attained.

The animal is always brightly coloured with reddish brown, whatever may be the hue of the shell. Its head is rather long, of a dark mottled madder-brown hue, paler at the crenated extremity of the muzzle. The tentacula are long, smooth, subulate, white or pinkish, and marked down their centres by an orange-brown line. At the inner sides of each tentacle is a very small almost rudimentary capital lobe, and on the outer side a stout white eye-peduncle bearing a greenish-blue eye at its extremity with a black central point. On each side of the neck is a large white plain-edged lappet. The side-lobes are pale with brownish dots and markings, crenated at their edges, and bear three subulate white or pale brownish cirrhi on each, with minute rudimentary lobes at their bases, recalling the appearance of the tentacular and capital lobes. The sides of the foot are closely-painted with rich reddish brown colour. The foot itself is oblong, truncated and obtusely angled in front, obtusely pointed behind, and minutely crenated at its edges, which are pale, whilst the central disk is of a bright salmon colour. The opercular lobe is short. The branchial plume is long and linear lanceolate. The margin of the mantle projects slightly beyond the shell, and is plain. The jaws are small, bent, and corneous. The tongue has its central denticle escutcheon-shaped, with a broad incurved apex; the laterals have slightly and the accessorials greatly curved and narrow points.

This handsome but common shell is found on all our shores, and enjoys a range of from low-water-mark to fifty fathoms, at which depth it lives on the Ling banks off the Zetland shores. Its favourite habitat is in the laminarian zone. The white variety (*Lyonsii*) is, perhaps, most abundant in the Irish Sea. It is very plentiful around Anglesea, in which district the smooth variety with tumid whorls has been plentifully taken (M'Andrew).

Abroad it ranges from Norway to the Mediterranean. As a fossil it first appeared in our area during the coralline crag epoch.

### T. CONULUS, Linnæus.

Resembling *zizyphinus,* but combining smoothness and flatness of volutions, with a purely conical figure, and a rectilinear lateral outline.

Plate LXXIII. figs. 1, 2.

BONANNI, Recr. pt. 3, pl. 93.

*Trochus conulus*, LINN. Syst. Nat. ed. 12, p. 1230.—Brit. Marine Conch. p. 255. —DILLW. Recent Shells, vol. ii. p. 988. — WOOD, Index Testac. pl. 29, f. 93. — LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 142. — PAYRAUD. Cat. Moll. Corse, p. 125.— PHILIPPI, Moll. Sicil. vol. i. p. 175, and vol. ii. p. 149, var. a.

„ „ *&c.* CHEMN. Conch. Cab. vol. v. pl. 166, f. 1588.

The synonymy of this elegant *Trochus*, might have been much increased, had we possessed more leisure to investigate its exotic varieties. It was only, however, just previous to transferring this page from our own hands, that we were induced by a letter from our friend Mr. Bean, to include the species among our native shells, since neither Pennant's nor Turton's *conulus* present the characteristic features of the species. The individual delineated in our engraving, was, we are assured by that gentleman, taken alive by his son, on a voyage from Newcastle to London. "The man was heaving the lead, somewhere on this (the northern) side of the Lincolnshire coast, when this shell adhered to it. I had the pleasure of extracting the animal."

The specimen alluded to, which is not a typical or peculiarly characteristic *conulus*, is conical, moderately broad, and with its lateral outlines nearly straight or barely subretuse. It is tolerably strong, not transparent, and of a shining livid, or olivaceous white (assuming a rather more bluish cast toward the apex), adorned longitudinally with distant angular spots and intermediate flexuous lines of fawn-colour, the latter of which are somewhat interrupted, and evince a disposition towards a spiral arrangement likewise. These markings are irregularly continued upon the convex and extremely prominent basal belt, which is rather broader than is usual in this species; the inferior surface of the shell displays four or five distant articulated bands of fawn-colour and livid white, upon a ground of paler fawn. Excepting two or three grooves around the imperforated axis, a few indistinct spiral striæ upon the base, and about two profound striæ upon the second volution, the entire shell is smooth. The eight nearly flat and greatly shelving whorls, which increase rather slowly in length, are somewhat narrow, the height not being one half the width of even the superior suture, and terminate in a rather acute apex, that is not distinctly granulated, but when highly magnified appears punctulate (possibly from abrasion of the surface). The base is abruptly compressed, nearly flat, and angulated at the circumference. The aperture is rhomboidal, much broader than long, occupies about two-sevenths of the entire length of the shell, and about half the basal diameter. The outer lip, which is simple and acute, recedes moderately at the base. The pillar-lip is rather short, oblique, slightly curved, and a little tortuous.

The breadth at the base, which is scarcely exceeded by the length of the axis, is just one-third of an inch.

Independently of the difference of colouring, an essential character in the *Trochi*, the smooth variety of *zizyphinus* does not present a simply conical figure, but has its whorls more convex, and its lateral outline more arcuated.

This species is a southern form, common in the Mediterranean. Its presence in our seas is probably not due to an occurrence in the bounds of its present limits, but rather may have relation to its ancient existence in the region of the crag. It is recorded by Mr. Searles Wood as a fossil of the coralline crag at Ramsholt.

### T. ALABASTRUM, Beck.

Uniform white, or tinged with golden yellow upon the carinæ only; whorls of the spire with three strong spiral keels, the body volution with four; axis imperforated.

Plate LXVI. fig. 7, 8, as T. formosus.

*Trochus quadricinctus* (FOSSIL undescribed) Annals Nat. Hist. 1842.
„ *occidentalis*, MIGHELS and ADAMS, Boston Jour. Nat. Hist. (Nov. 1841) vol. iv. p. 47, pl. 4, f. 16 probably.
*Margarita alabastrum*, BECK in Lovèn's Index Moll. Scand. (1846) p. 20 (from type).
*Trochus formosus*, FORBES, Annals Nat. Hist. vol. xix. (Jan. 1847) p. 96, pl. 9, f. 1.—S. WOOD, Crag Moll. p. 125, pl. 13, f. 2 (fossil).

This extremely rare shell is wrought with a sculpture so peculiar, as to enable us to distinguish even a fragment of it from any of its British congeners. This consists of a few very prominent, strong, but rather narrow, rounded, but sharply defined, subequidistant carinæ or spiral belts, of which the top one is generally broken into tubercles; indeed, upon the upper volutions, two if not the whole three—for such is the usual number, excepting upon the body, which is generally adorned with four—are similarly affected; the interstices are smooth, and a little concave. The general shape of the shell, which does not appear to be particularly solid, nor yet translucent, and seems but slightly polished (the examples taken are chiefly dead specimens, so that we presume not to speak decidedly on these points), is simply conical, with the lateral outlines straight or subretuse; it is either devoid of all colour, or more rarely has the belts of a pale golden yellow. The elongation of the whorls, which are about six in number, is slow; they are rather narrow, moderately ventricose, and appear the more distinctly separated from the carinæ not touching the suture either above or below: the apex is small, yet can scarcely be termed acute. The basal circumference is angulated; the angle for the most part is a right one, the base itself is flattish or hardly at all rounded, and is merely encircled with two broad grooves near the margin, and about four round the imperforated axis, the broad strip between these two sets being devoid of all sculpture whatsoever. The interstitial spaces between the sulci assume the appearance of depressed belts, but are not distinctly raised above the general level of the superficies. The mouth is nacreous, subquadrangular, much broader than it is long, and occupies about a third of the entire length of the shell, and about one half of the basal diameter: it merely exhibits the vestiges of the external carinæ, not being distinguished by any peculiar sculpture of its own. The outer lip is acute; the pillar white, narrow, straightish, and not much rounded. Few of our British specimens attain to the length of half an inch.

The animal, which we were so fortunate as to examine alive, in one of the specimens dredged off Fair Island, is entirely pure white. The head terminates in a rather narrow proboscis and bears two long subulate tentacula which are minutely ciliated; the eyes are black and placed on rather large peduncles; the capital lobes are minute and imperfectly developed. The neck-lappets are of moderate size and plain-edged; the lateral cirrhi are three on each side and rather short and slender as compared with the tentacles; they are carried closely appressed to the shell. The operculum is very pale horn-colour. The foot is very broad oblongo-triangular, truncated in front with produced and mucronated angles.

This beautiful species was first taken in the British sea, in 1846, in fifty fathoms, among stones on the Ling banks off Zetland, and in from forty-five to sixty fathoms off Fair Island (M'Andrew and E. F.). It has since been taken by Mr. Jeffreys at thirty miles east of Lerwick. Mr. Barlee has taken it in the same region, and Lieut. Thomas has dredged it on a stony bottom in sixty fathoms off Troup Head, Aberdeenshire, and in forty to eighty fathoms on both sides of the Orkneys. During the same year it was briefly characterized by Lovèn, under Beck's MS. name of *Margarita alabastrum*, and recorded as ranging from Bergen to Finmark, on the Scandinavian shores. Should it prove the *T. occidentalis* of North America, as judging from the description we think likely enough, that name must be substituted for Beck's. It appears to be an Arctic form. It is found fossil in both coralline and red crags (Searles Wood).

### T. GRANULATUS, Born.

Whorls with numerous fine granulated or corded spiral costellæ; base rounded, imperforated.

Plate LXVII. fig. 7, and pl. LXVIII. fig. 2; Animal, pl. DD. f. 4.

*Trochus papillosus*, DA COSTA, Brit. Conch. p. 38, pl. 3, f. 3 (probably).—DONOV. Brit. Shells, vol. iv. pl. 127. — MAT. and RACK. Trans. Linn. Soc. vol. viii. p. 155.—RACK. Dorset Catalog. p. 48, pl. 16, f. 6. — TURT. Conch. Dict. p. 190, f. 62. — FLEMING, Brit. Anim. p. 323. — FORBES, Malac. Monens. p. 22, animal.—BROWN, Illust. Conch. G. B. p. 19, pl. 11, f. 13, 14.—DILLW. Recent Shells, vol. ii. p. 800.—WOOD, Index Test. pl. 29, f. 95.

„ *granulatus*, BORN, Test. Mus. Cæs. Vind. p. 337, pl. 12, f. 9, 10.—Brit. Marine Conch. p. 162.—LAM. Anim. s. Vert. (ed. Desh.)

vol. ix. p. 145. — BLAINV. Faune Franç. Moll. p. 260, pl. 10, f. 5. — PHILIPPI, Moll. Sicil. vol. i. p. 174, pl. 10, f. 22, 22, a ; vol. ii. p. 149.

*Trochus fragilis*, PULTENEY, Hutchins, Hist. Dorset, p. 44.

„ *tenuis*, MONT. Test. Brit. p. 275, pl. 10, f. 3.

Although known traditionally as the *papillosus* of Da Costa, the description by that author is not merely indefinite, but essentially adverse, and his delineation by no means characteristic. Hence we have preferred the name applied to the species by Born, almost immediately afterwards.

The obliquely conoid form of this elegant *Trochus*, is modified by the dilatation and tumidity of its base. Of the eight or nine volutions that compose the shell, the upper ones are nearly flat, the penult and ante-penult are slightly or moderately convex, and the last, or body-whorl, is rounded: the apex is acute, and not differently coloured from the rest of the surface. The general hue of the shell, which is thin and glossy, and not quite opaque, is a flesh-colour, that varies in its intensity and tint, being often tinged with brown or yellow; a few scattered longitudinal spots, of a rufous or darker shade of the same colour, appear upon the whorls, and a few rows of similarly-painted oblong dots are sparingly and subarticulately disposed upon the spiral belts of the base, and are often apparent (though irregularly and indistinctly) upon those of the spire likewise. There is an Albino variety, but it is rare. The sculpture consists of numerous narrow granulated spiral belts, that gradually change into depressed and simple ones upon the base. There appears to be a considerable latitude as to the number of these belts, their degree and style of granulation, &c. There are generally from six to eight upon the penult and ante-penult whorls, and the one that precedes the obscurely indicated suture is rather broader than the rest, and occasionally is spirally subdivided. Here and there a scarcely-raised very fine intermediate stria shows itself in the interstices, which are always rather broader, or at least as broad, as the belts. The granules upon the smaller whorls are more rounded than those upon the larger volutions, the belts of which latter have frequently somewhat the look of twisted ropes. The apical whorls are cancellated. The usual number of belts upon the upper part of the body is eight or nine, besides the obtuse carina ; the entire surface of the shell is more or less distinctly marked with delicate longitudinal wrinkles. The base is tumid, and imperforated. The mouth is large, broader than it is long, and not distinguished by any sculpture whatsoever ; the hinder angle of it is an obtuse one ; the outer lip is very acute ; the pillar is broad, strong, arcuated, and white. In a Mediterranean example, however, it is edged behind with rufous and tinged with pink.

The animal is much larger in proportion to the shell than that of any other native *Trochus.* It is of a general whitish hue, with brown markings. The head terminates in a strong and thick muzzle, much speckled with brown. On each side is a subulate smooth tentacle, marked with a brown line down its centre. The eye-peduncles are stout and white, and the eyes blue. The head-lobes are nearly obsolete. The neck-lappets are very large, white, and even, or only obsoletely crenated at their edges. The lateral lobes are white, rugosely crenate, and bear three white filaments at each side. The sides of the foot are very broad, and thickly speckled with brown. The very large foot is lanceolate truncate in front, with mucronated angles, and terminating in a point behind.

This handsome shell is very local, and appears to be confined to our southern shores and the Irish sea. Herm, in the Channel Islands; Weymouth and Brixham (S. H.); in fifteen fathoms, west bay of Portland (M'Andrew and E. F.); Exmouth (Clark), Plymouth, Falmouth, Whitesand Bay (Jeffreys), Fowey (Peach); north-west coast of Isle of Man in twenty-five fathoms, on a scallop beach, not rare (E. F.); Dublin coast (Warren), Wicklow (Farren), Youghall (Ball), coast of Cork (Humphreys).

It does not occur to the north of Britain, but southwards ranges to the Mediterranean. Its history as a fossil is doubtful.

### T. MILLEGRANUS, Philippi.

Conical, either whitish, or only articulated with pink on the raised sculpture; whorls with numerous cordlike raised striæ, and a strong inferior marginal belt: apex not coloured; base flattened, imperforated.

Plate LXVI. fig. 9, 10.

*Trochus Clelandi*, GRAY, in Wood's Index Testac. Suppl. pl. 5, Troch. f. 15 (1828).
,, *millegranus*, PHILIPPI, Moll. Sicil. vol. i. p. 183, pl. 10, f. 25; vol. ii. p. 154 (fossil). — THOMPSON, Ann. Nat. Hist. vol. v. p. 245.—HANLEY, Brit. Marine Conch. p. xxxix. f. 36.—LOVÈN, Index Moll. Scandinav. p. 20.
,, *Martini*, SMITH, Mem. Werner. Soc. vol. viii. p. 99, pl. 1, f. 26.—MACGIL. Moll. Aberd. pp. 132, 349.—Brit. Marine Conch. p. 164.—BROWN, Ill. Conch. G. B. p. 129. pl. 57, f. 11.

This pretty *Trochus* has a simple conical figure, but varies in the relative proportions of height and base; its lateral outline is rectilinear, its apex acute, and its base flattened and imperforate. It is opaque, or nearly so, tolerably strong, more or less dull-surfaced, and of a white or yellowish-white hue, that is either uniform or else distantly articulated with madder-lake upon its spiral sculpture. The elongation of the whorls, which are seven or eight in number, is gradual; they are flat or nearly so, rather abruptly shelving, well defined at the suture, and moderately broad, that is to say their length is equal to about one-third to two-fifths of their breadth. They are spirally girt with a rather broad and prominent basal belt, and with about five or six obliquely subgeniculately granular raised striæ, whose interstices—which, in the final volutions are much broader than the striæ—are crowdedly traversed by very oblique raised wrinkles, that, in certain specimens, are so immediately connected with the granules, as to form continuous series of produced tear-drops. The prominent belts, likewise, are not simple, but granular and spirally striated: the elevated lines upon the base are decidedly broader, rather more distant, and as well as their interstices, faintly exhibit the superior sculpture. The aperture is subquadrate, but very much broader than long, the width being fully equal to half the basal diameter, whilst the height does not occupy one-third of the total length of the shell. It is not adorned with any other sculpture than the indications of that of the exterior upon its silvery nacre; the outer lip is acute, and subrectangular below; the pillar is white, very short, nearly rectilinear, and slightly oblique. One of our larger specimens is nearly seven lines in length, with a base of fully half an inch in diameter. The coloured individuals have generally their sculpture more granular and better defined; in certain shells, too, there are similar, but much finer, spiral striæ between the five principal series.

Although but recently described as a living shell, some Irish examples were in the cabinet of Donovan; and the individuals engraved by Wood — whose name, though prior, we cannot prefer, owing to the imperfect definition of the species by his reduced figure—came from the same locality.

The animal, which we have examined on the Manx coast, and of which Mr. Alder has kindly communicated a drawing, is of a whitish hue mottled with brown. The head is deeply tinged with brown; the head-lobes are rudimentary. The tentacles are smooth and subulate, white, with a brown line: the eye-peduncles are white, the eyes black. The neck-lappets are pale and even-edged. There are three brownish-white cirrhi on each side springing from the pale side-lobes. The sides of the foot are deeply tinged with brown. The foot is lanceolate, pointed behind, but with obtuse angles in front.

This species is much more generally diffused around our shores than was once supposed, and though on the whole a scarce shell, has been taken in all our provinces. It appears to be most frequent in the Hebrides. A few localities will serve to illustrate its range in depth. In fifteen to twenty fathoms, West Bay of Portland, Welsh coast, Oban, and Skye; in thirty to thirty-five fathoms, Loch Fyne, Mull, and Moray Firth; in forty-five to fifty fathoms, Zetland, and in ninety fathoms off Mull (M'Andrew and E. F.). It occurs on both sides of England, both sides of Scotland, and both sides of Ireland. Lieutenant Thomas finds it in deep water, on a stony ground, in from thirty to one hundred fathoms on the north and north-east coast of Scotland. Mr. Jeffreys notes its occurrence on leaves of Fuci (Laminariæ, probably), in five fathoms. He has found the more conical variety at Fishguard. It ranges from Norway to the Mediterranean, and occurs fossil in the coralline crag.

### T. EXIGUUS, Pulteney.

Small, conic, imperforated; whorls with a prominent marginal belt, above which are a few finer spiral costellæ that are not simple; the interstices obliquely traversed by longitudinal raised lines; apex rosy.

Plate LXVI. fig. 11, 12.

*Trochus exasperatus*, PENN. Brit. Zool. ed. 4, vol. iv. p. 126. — FLEMING, Brit. Anim. p. 323.
„ *minutus, &c.* CHEMNITZ, Conch. Cab. vol. v. pl. 162, f. 1529 (probably).
„ *exiguus*, PULTENEY, Hutchins, Hist. Dorset, p. 44.—MONT. Test. Brit. p. 277. — MATON and RACK. Trans. Linn. Soc. vol. viii. p. 156.—RACK. Dorset Catalog. p. 48, pl. 21, f. 4. — TURT. Conch. Diction. p. 190. — Brit. Marine Conch. p. 163. — BROWN, Illust. Conch. G. B. p. 19, pl. 11, f. 27, 28.—WOOD, Index Testac. pl. 29, f. 91.
*Trochus conulus*, (not Linn.) DA COSTA, Brit. Conch. p. 40, pl. 2, f. 4. — DONOV. Brit. Shells, vol. i. pl. 8, f. 2.
„ *minutus*, DILLW. Recent Shells, vol. ii. p. 797.
„ *erythroleucus*, LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 151. — HANLEY, Conch. Book of Species, p. 70.
„ *interruptus*, WOOD, Index Test. Suppl. pl. 6, Troch. f. 42?

The name *exasperatus* was attributed to this species by Pennant, but was merely applied by him to the delineation of a shell which was otherwise unknown to him. On the same principle that we object to Gmelin's habit of indiscriminately bestowing Latin appellations upon all engravings of zoological subjects that he could not distribute among the ascertained and characterized species, we have here repudiated the prior name of an undefined shell.

In our British specimens, the shell is simply conic, but varies considerably in the relative proportions of its length and base; the lateral outlines are more or less rectilinear. It is tolerably strong, opaque, but little shining, and ranges in colour from tawny, or ashy fulvous brown, or olivaceous fulvous, to crimson red. In all cases, however, the apex, which is very small, and more or less acute, is invariably of a crimson red, and the surface, especially the belts, are more or less stained, spotted, or articulated with pink; when the ground is rose-coloured, it is generally speckled with white. There are six or seven volutions, which are tolerably long, since upon the penult whorl the length rather exceeds half the breadth of the superior edge; their increase, however, is not particularly rapid. They are flat, but margined below with a rather broad prominent rounded and spirally-striated belt, above which are three or four narrow spiral costellæ, all which, as well as their broader and rather profound interstices, are subcrenately or subgranosely roughened by obliquely longitudinal elevated lines that are not very densely disposed, and are a little arcuated, especially along the groove above the marginal belt. These costellæ, which upon the base are rounded, prominent, and often subarticulately painted with white, become likewise almost simple there, since the longitudinal lines, which in their intervals are much finer and more closely disposed than those upon the spire, are scarcely, indeed, manifest upon them. The base is rather compressed, very little rounded, except near the lip, and is sharply angulated at the edge: its axis is imperforated. The mouth, which is sometimes thickened in front by a linear callosity, is rather small, simple (not sculptured), of a squarish shape, and not much broader than long; it occupies about one-third of the entire length of the shell, and about one-half the basal diameter. The outer lip is acute. The pillar, which is short, white, narrow, and almost rectilinear, sometimes exhibits, from the concavely appressed posterior inner edge, an obscure toothlike projection near its lower end; it is not dilated above, but rather the contrary. The average length of our specimens is five lines, and their breadth at the base about three and a third.

We have hesitated to unite the Mediterranean *pyramidatus* (Lam. Anim. s. Vert. (ed. Desh.) vol. ix. p. 150.—Deles. Rec. Coquil. Lam. pl. 36, f. 2.—*T. crenulatus*, Philippi, Moll. Sicil. vol. i. p. 176; vol. ii. p. 150.—*T. Matoni*, Payraud. Moll. Corse, p. 126, pl. 6, f. 5, 6.—*T. tricolor*, Risso, H. N. Europe Mér. vol. iv. p. 127, fig. 135?), although a more extended knowledge of the essential difference between specific and varietal distinction, or the acquisition of intermediate examples, may render their union advisable. Our specimens of the latter shell are greatly more produced, have more numerous whorls, the lower ones of which are retuse rather than flat, are longitudinally painted, besides being articulately marked upon the raised sculpture, with brown or red spots, that do not extend to the articulated marginal belts, or else are obliquely striped (and upon the base likewise) with blackish brown longitudinal streaks. The interstitial striæ, moreover, are so fine, as to be almost imperceptible, and the marginal belts are broader in proportion to the granulated spiral costellæ.

The animal has the sides of the foot, the tentacles, and lateral cirrhi tinged with madder red. The eye-peduncles are white, as is also the disk of the foot.

This shell is almost confined to our southern shores. It occurs at Guernsey (Barlee); Herm, Torquay, and Margate (S. H.); in seven fathoms, alive, Weymouth Bay (M'Andrew and E. F.); Cornwall (Dr. Turton); Bantry Bay (L. W. Dillwyn); Cork (Humphreys); Dublin Bay (Warren). The four latter localities are communicated by Mr. Jeffreys.

It is not found to the north of the British isles, but ranges southward to the Mediterranean.

### T. STRIATUS, Linnæus.

Small, conical; whorls flat, with eight or nine spiral costellæ, which are so little raised, that the volutions, especially the upper ones, might equally be termed sulcated, devoid of any prominent basal belt; interstices, and oftentimes the costellæ, longitudinally striated; base broad, angulated at the margin, flat, or slightly concave, imperforated.

Plate LXVI. fig. 5, 6.

GUALTIER, Index Test. pl. 61, f. N. — CHEMN. Conch. Cab. vol. v. pl. 162, f. 1527, 1528.

*Trochus striatus*, LINN. Syst. Nat. ed. 12, p. 1230.—PULTENEY, Hutchins, Hist. Dorset, p. 44.—MONT. Test. Brit. p. 278.—FLEMING, Brit. Animals, p. 323.—Brit. Marine Conch. p. 164.—BROWN, Illust. Conch. G. B. p. 19, pl. 11, f. 25, 26.—DILLW. Recent Shells, vol. ii. p. 797.—WOOD, Index Test. pl. 29, f. 90.—BLAINVILLE, Faune Franç. Moll. p. 266, pl. 10, f. 9.—PHILIPPI, Moll. Sicil. vol. i. p. 176; vol. ii. p. 150.

*Trochus parvus*, DA COSTA, Brit. Conchol. p. 41.

„ *conicus*, DONOV. Brit. Shells, vol. v. pl. 155, f. 1.

„ *erythroleucus*, MATON and RACK. (not Lamarck) Trans. Linn. Soc. vol. viii. p. 156.—RACK. Dorset Catalog. p. 48, pl. 18, f. 2. —TURT. Conch. Diction. p. 191.

„ *depictus*, DESHAYES, Exped. Morée, Moll. p. 143, pl. 18, f. 23, 24, 25.

„ *Sartorii*, ARADAS and MAGGIORE, Sunto di quatro mem., &c., fide PHILIPPI, Moll. Sicil. vol. ii. p. 225.

We are not surprised that some of our British writers have not recognised the Linnæan *striatus* in this long known shell, since the type of its founder exhibits a linear style of painting, which, although common enough in the Mediterranean, we have never observed in any of our native examples. The contour of this small, but strong, species is simply conic, and its lateral outline (an important character in this genus) is straightish or even a little retuse. The opaque surface is not much polished, but is generally a little glossy; it displays a remarkable variety of patterns, but the two principal are the streaked and the articulated. In the former, and this indeed is the ordinary painting, several wavy and obliquely longitudinal streaks of crimson or blackish brown, that are often clouded at one of their edges, not unfrequently interrupted, and often partially confluent, diversify the whitish or pale-coloured ground; these in our English specimens are almost invariably broad, and are replaced upon the inferior surface by a spiral articulation of the same colours. In one of our specimens of the latter, the ground is yellowish drab, and the raised sculpture is alternately dotted with a paler tint of the same hue, and with ashy-brown. The whorls are devoid of any peculiar marginal belt, but are spirally adorned with eight, or more frequently nine, elevated lines or very narrow costellæ, that are but little raised, and except upon the base, where they are rounded and further apart, not particularly distinct, especially upon the upper portion of the spire, which might rather be termed striated or sulcated. The interstices, and very often the raised sculpture likewise, are minutely and very obliquely traversed by crowded longitudinal laminar lines. The volutions, which are six or seven in number, and terminate in an acute and often ruddy apex, are flat (except two or three of the apical ones) and occasionally somewhat retuse in the middle; they are moderately high, the length of the penult being about one half the breadth of the upper edge of that volution: the suture is indistinct. The base is broad (in our British examples), rather abruptly compressed, sharply angulated at the edge, and either flat, or, from the customary inferior projection of the basal edge, rather concave near the margin; the axis is imperforated. The aperture is squarish, as the excess (if any) of the breadth is but trifling; it occupies about half the basal diameter, and about one third of the length of the whole shell. There are neither tubercles, crenæ, nor any peculiar sculpture upon it; the anterior portion is, however, thickened by a more or less distinct linear callosity. The outer lip is simple and acute; the pillar is straight, narrow, not much rounded nor dilated, and succeeded by a faint concavity. Ordinary specimens do not exceed two-fifths of an inch in length, and a third of an inch in breadth.

Certain of the Mediterranean examples differ so widely at first sight from the variety which inhabits our own shores, as scarcely to be recognisable for the same species. In the typical or first described form, the whorls are a little swollen at the sutures, and the surface both above and below is radiated with continuous wavy and obliquely flexuous lines of black, that are often double upon the body-volution. In the produced variety the colouring has generally an articulated arrangement, the whorls are narrower and longer, and as well as the base, which is destitute of the ordinary angulation, much more rounded.

This shell is, as a British species, confined to our southern shores. It inhabits the laminarian zone, living on the leaves of *Zostera*, as at Herm and Torbay (S. H.), Guernsey (Barlee); Exmouth (Clark); on the Devonshire and Cornish coasts; common at Falmouth (Alder); in fifteen fathoms off the Land's End (M'Andrew); coast of Cork and Bantry Bay (Humphreys); Baltimore harbour (Allman).

It does not occur to the north of Britain, but ranges southwards to the Mediterranean.

## T. Montagui, Gray.

Produced-conical, imperforated, small; whorls more or less rounded, with only about five or six distinctly separated spiral costellæ, and no marginal belt: the interstices striated longitudinally; painting usually consisting of brown longitudinal lines on a yellowish white or ash-coloured ground, which are often so interrupted in the interstices, that the spiral costellæ appear articulated.

Plate LXV. figs. 10, 11.

*Trochus Montagui*, Gray in Index Testac. Suppl. pl. 6, Troch. f. 43. — Brit. Marine Conch. p. 255, f. 18.
„ *striatus*, Forbes, Malac. Monens. p. 22, animal.

This plain-looking little shell has a more elongated form than our other British *Trochi.* It is of a produced conical figure, with the lateral outlines straightish, but more inclined to convexity than retusion. It varies in strength and lustre, but is never highly polished, and is composed of seven slightly convex volutions, whose elongation is by no means rapid (especially in the lower ones, which are rather high, their breadth above being only double their length), that are very abrupt in their declination, and terminate in a small but obtuse point; a slight disposition to angularity sometimes exists beneath the suture upon the body-whorl. Five narrow and somewhat rounded costellæ spirally encircle them; whose intervals, which are broader, or at least as broad as the belts, are obliquely and closely traversed by most delicate longitudinal raised striulæ, that occasionally (and possibly always in the finer preserved individuals) cross the costellæ likewise; a precisely similar sculpture is continued upon the base of the shell. There is no marginal belt, but two costellæ often approximate at the outer margin of the base. The ground of the shell is dirty white, or ash-coloured, and the raised spiral sculpture is articulately painted with ochraceous or rufous brown lines, that present the appearance of longitudinal flexuous linear streaks, and, indeed, are occasionally continuous; besides these, there are in certain individuals, a few larger remote spots beneath the well defined sutures. The base, whose surface is a little rounded, especially near the lip, is angulated, though not very sharply, at its outer margin: its axis is imperforated. The aperture is subquadrate, and its breadth is not very much more than its length, the former being half that of the basal diameter, the latter occupying one-third of the total length of the shell. It has no peculiar sculpture; the outer lip is simple, acute, and somewhat arcuated anteriorly; the pillar is nearly perpendicular, not much spread, and becomes rather broader as it approaches the former. A rather fine specimen measured three-eighths of an inch in length, and one-third less in breadth.

The animal is white, with black markings. The head bears long white tentacula and white eye-peduncles, with black eyes. The capital lobes are minute. The neck-lappets are white; the sides of the foot much marked with black. There are three slender white cirrhi on each side. The foot is lanceolate with obtuse angles anteriorly.

So far as known this *Trochus* is almost peculiarly British, and even on our shores is not found everywhere. On the east coast of England it is recorded by Mr. Bean from Scarborough. On the south it ranges to the Channel Isles, where it is dredged at Herm (S. H.); in from seven to twenty fathoms west bay of Portland (M'Andrew and E. F.); Exmouth, Fishguard (Jeffreys); not rare in the Irish sea; in fifteen to twenty fathoms on the Welsh coast, and in twelve to twenty-five on the Manx coast; in from fifteen to ninety fathoms among the Hebrides (M'Andrew and E. F.), where it has been taken in many localities by Mr. Jeffreys; Lamlash bay, Arran (Alder); in fifty fathoms off Cape Wrath, and in forty-five fathoms off Fair Island (M'Andrew); in seven fathoms off the Dudgeon; in thirty-five fathoms, Buchaness; in from seven to forty fathoms around the Orkneys, "the individuals are not numerous anywhere; generally in deep water or stony ground" (Thomas); Portmarnock (Warren); in ten fathoms Bantry bay, and sixty fathoms off Cape Clear (M'Andrew). The only foreign locality recorded is Vigo bay in Gallicia, where it was dredged by Mr. M'Andrew in May, 1849.

### T. tumidus, Montagu.

Small, perforated; whorls ventricose, more or less subscalariform; spiral striæ extremely numerous, and very delicate: markings linear, flexuous, and somewhat interrupted.

Plate LXV. figs. 8, 9, and Animal, plate D D. fig. 2.

*Trochus tumidus*, Mont. Test. Brit. p. 280, pl. 10, f. 4. — Maton and Rack. Trans. Linn. Soc. vol. viii. p. 153. — Rack. Dorset Catalog. p. 48, pl. 16, f. 9, 10. — Turt. Conch. Diction. p. 187. — Flem. Brit. Anim. p. 322. — Forbes, Malac. Monens. p. 23 (animal). — Johnston, Berwick Club, vol. i. p. 265. — Macgil. Moll. Aberd. p. 133.—Brit. Marine Conch. p. 161. —Brown, Illust. Conch. G. B. p. 18, pl. 11, f. 2, 3.—Wood, Index Testac. pl. 28, f. 41. — Blainv. Faune Franç. Moll. p. 272.—Hanl. Young Conch. p. 70.

„ *patholatus*, Dillw. Recent Shells, vol. ii. p. 776.

„ *Rackettii*, Payraud. Moll. Corse, p. 128, pl. 6, f. 9, 10? — Philippi, Moll. Sicil. vol. ii. p. 153.

„ *nitens* (fossil) Woodward, Geol. Norf. pl. 3, f. 10.

„ *Nassaviensis*, Recluz, Revue Zool. Cuvier. 1843, p. 107.

? *Margarita undulata, var. Trochiformis*, Forbes, Ann. Nat. Hist. vol. xix. p. 97. —Fry. *Skenea Serpuloides*, Macgil. Moll. Aberd. p. 135 (fide Jeff. from type).

This shell, indeed, bears some likeness to a pygmy *cinerarius*, but the more scalariform mode of its gyration will readily distinguish it. It has been conjectured to be identical with the *T. Nassariensis* of Chemnitz (Conch. Cab. vol. v. pl. 171, f. 1676.—*T. patholatus*, Gmel. Syst. Nat. p. 3574), but even if so,—a conclusion certainly not warranted by the figure,—the extremely imperfect definition of that shell would invalidate the claim of priority.

The general shape ranges from rather obtusely conic to orbicular conoid; the base is generally more or less flattened, rarely a little convex near the mouth, and moderately shelving; the lateral outline is somewhat arched, and more or less scalariform. The shell is small, rather strong for its size, sometimes opaque, sometimes very slightly diaphanous, more or less dull, and of a pale ash-colour, variegated with more or less interrupted oblique and wavy lines of chestnut, brown, or greyish brown, which often become partially or entirely obsolete upon the base; in certain individuals, the continuity of the lines being no longer perceptible, the surface appears spirally articulated with rather distant coloured minutely oblong dots; in others there are additional squarish spots below the sutures. Both the upper and lower surfaces are encircled with fine and numerous raised lines, which are generally fewer, coarser, and more distant in the northern examples. There are frequently, besides, some fine spiral striulæ in the interstices, and the whole shell is microscopically traversed by obliquely longitudinal and most densely disposed wrinkles. There are six volutions, which increase with moderate quickness; the apex is tolerably acute; the next whorls more or less rounded; the two or three last are narrowly angulated below the suture, and then become flattish and but little shelving; there is often, besides, a very slight but diffused retusion upon the body-whorl, which causes the basal outline to appear submarginated and bluntly subangular. In certain of the southern examples, the angular character of the shell becomes almost entirely lost, and these individuals entirely agree with the specimens of *Rackettii* forwarded to us by Dr. Philippi.

The aperture is squarish, and broader than it is high; the length in general is not equal to that of the spire, the breadth is equal to, or rather exceeds, half the basal diameter. There is no particular sculpture; the nacre is generally brilliant; the outer lip is acute; the pillar lip rather oblique, straightish, a little incurved above, generally reflected there, and sometimes so much so as partially to conceal the small but profound umbilicus, the mouth of which latter is smooth, large, and abrupt. Our largest specimen (a Shetland one) measures four lines and a half in length, and the same at the base.

The animal is of a white or yellowish white hue, speckled with black or lead-coloured markings. Its muzzle is rather broad, finely crenated at its edges, and is marked with dark transverse lines. The tentacles are setaceous, white, and (as well as the lateral filaments) as if finely frosted, being covered with fine cilia. The eye-peduncles are white, the eyes dark. The head-lobes are rather large and even. The neck-lappets have even edges and are white. The sides of the foot are more or less mottled and streaked with dusky colouring. The disk of the foot is oval, rounded in front and obtuse behind.

In the curious variety (?) from the Zetland seas, described in the 19th volume of the "Annals of Natural History" as a form of *Margarita undulata*, the markings of the foot are brownish, the foot itself angulated in front, and the tentacles more subulate and much more strongly ciliated. These characters would seem to indicate specific distinctness. The only specimen of the shell taken was in the cabinet of Mr. M'Andrew, but unfortunately has been accidentally destroyed.

Abundant everywhere all round our shores, inhabiting for the most part the coraline zone, but occasionally ranging from seven to as deep as sixty or even eighty fathoms. It ranges throughout the western seas of Europe, and is found fossil in the red crag.

### T. CINERARIUS, Linnæus.

Whorls flattish, with coarse raised spiral striæ, and fine linear iron-grey markings on an ash-coloured ground; axis with a rather narrow perforation.

Plate LXV. fig. 1, 2, 3, and (Animal) Plate D D, fig. 1, and 1 a.

LISTER, Hist. Conch. pl. 641, f. 31.

*Trochus cinerarius*, LINN. (not Born) Syst. Nat. ed. 12, p. 1229.—DONOV. Brit. Shells, vol. iii. pl. 74, top and bot. figs.—MONT. Test. Brit. p. 284. — TURT. Conch. Diction. p. 187. — FLEM. Brit. Anim. p. 322.—FORBES, Malac. Monens. p. 23 (animal).—JOHNST. Berwick, Club, vol. i. p. 264.—MACGILL. Moll. Aberd. p. 133 (chiefly).— Brit. Marine Conch, p. 161.—BROWN, Ill. Conch. G. B. p. 18, pl. 11, f. 5, 8.—MÜLLER, Zool. Danic. pl. 102, f. 1 to 4.—CHEMN. Conch. Cab. vol. v. p. 117, pl. 171, f. 1686.—DILL. Recent Shells, vol. ii. p. 779.—WOOD, Index Test. pl. 29, f. 49.—LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 149.—GEVENS, Conch. Cab. ed. 2, pl. 12, f. 119, 120.—HANL. Young Conch. p. 70.—LOVÈN, Index Moll. Scand. p. 20.

„ *lineatus*, DA COSTA, Brit. Conch. p. 43, pl. 3, f. 6.—PULTENEY, Hutchins, Hist. Dorset, p. 44.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 153.—RACK. Dorset Catalog. p. 48, pl. 16, f. 11, 12.

„ *perforatus*, SMITH, Mem. Werner. Soc. vol. viii. p. 99, pl. 1, f. 3, 4.—Brit. Marine Conch. p. 161.—BROWN, Illust. Conch. G. B. p. 18, pl. 57, f. 9, 10.

„ *inflatus*, BLAINVILLE, Faune Franç. Moll. p. 275, pl. 11, f. 5 (probably).

„ *lineolatus*, POTIEZ and MICH. Gal. Douai, Moll. vol. i. p. 334, pl. 30, f. 8, 9.

„ *littoralis*, BROWN, Illust. Conch. G. B. p. 18, pl. 11, f. 1, 4.

„ *electissimus*, BEAN, Brit. Marine Conch. p. 264.

There are two marked varieties of this common shell, which differ from each other in shape, and the consequent dilatation or contraction of the profound umbilicus. The one is rather bluntly conic, with a very small perforation; the other is much less elevated, expanded at the base, and with the aperture of the umbilicus commensurately enlarged; the latter form much resembles the young state of the former, but vies with adult specimens in size.

The whorls are six in number, well defined, but only slightly convex; in some of the flattened specimens, indeed, a slight concavity is perceptible towards, but not adjacent to, the suture; each volution is, as it were, distinctly raised out of the preceding one. The apex is extremely fine and small, and is very often tinged with yellow or a warm chestnut colour; the increase of length in the gyration is rather quick. The base is more or less flattened, and the basal outline is consequently more or less angulated.

Its sculpture, and its peculiar style of painting, form its most salient characteristics. The shell is strong, opaque, and rather dull, or but little glossy, with the surface roughened by several spiral belts, that vary greatly in number and thickness, but are always narrower than their interstices. There are generally from six to nine upon the penult whorl. These spiral lines are continued upon the base, where they become more approximate and less prominent. The interstitial spaces are smooth, or almost so. The entire exterior, which is greyish, cinereous, or yellowish ash-colour, is obliquely traversed by flexuous linear markings of iron- or slate-grey, smoke-colour, or more rarely of reddish brown, which are closely disposed, run in an opposite direction to the lines of growth, and do not become confluent, except occasionally upon the base of the shell. The aperture is subquadrate, and broader than, or at least as broad as, it is long; the interior is silvery white, and not at all grooved; the outer lip is simple, acute, and very oblique; the columella is straightish, white, and devoid of all tubercles, crenæ, or other markings. The umbilical cavity is white, and in one of the flat varieties is delicately chased with close-set longitudinal lines. In two adult individuals, which each measured seven lines at the base, the length of the conical variety was eight lines, of the depressed variety, barely half an inch. In neither case have we given the extremes; in the latter form, especially in the young, we have seen examples of which the basal diameter was actually, or all but, twice the length of the shell. In the variety *electissimus*, the minute longitudinal striulæ, that are occasionally visible in the interstitial spaces of the more typical form, appear, when highly magnified, to regularly traverse the elevated sculpture likewise.

The animal is white, with a yellow tinge, minutely speckled with opaque dots. The head is white and yellow; its muzzle is broad and crenated at the edge; the tentacula are large, subulate, and, under the lens, minutely ciliated; they are white, with obscure, dusky rings; between them are two well-developed, crenated head-lobes, which approach more nearly to each other than those of the next species. The eye-peduncles are stout and rather long; the eyes are black. The neck-lappets are white; the inner or columellar lobe has a fimbriated edge, that of the outer one is plain (they are both represented as crenated in the figure by mistake). The mantle is even-edged and white with slight dusky markings. The lateral cirrhi are white, with minute lobes at their bases, and are larger than in *umbilicatus*. The foot is oblong, rounded in front, and as if villose at the edges. The operculum is bright yellow. Lovèn represents the central denticle in the tongue of this species as greatly enlarged below and narrowly contracted beneath the slightly-incurved but not mucronated apex, and the laterals as being very strongly hooked.

Abundant everywhere on all our coasts, living among fuci on the lower belt between tide-marks, very plentiful in the laminarian zone, and occasionally occurring as deep as fifteen or even twenty fathoms. It varies much, and a form is rarely found which may prove to be a hybrid between this and the last. It ranges northwards to the shores of Finmark, and southwards to the coasts of Spain. It occurs fossil in the red crag and pleistocene deposits. On some parts of our coast it is called the *Dog-Periwinkle.*

### T. UMBILICATUS, Montagu.

Orbicular-conoid, generally perforated; spiral sculpture not granular, no marginal belt; painted with purplish red linear stripes on a yellowish or greenish white ground.

Plate LXVI. fig. 1 to 4, as umbilicalis.

*Trochus umbilicaris*, PENN. (not Linn. nor Lam.) Brit. Zool. ed. 4, vol. iv. p. 126, pl. 80, f. 106.

„ *umbilicalis*, DA COSTA, Brit. Conch. p. 46, pl. 3, f. 4.

„ *oblique radiatus*, CHEMN. Conch. Cab. vol. v. p. 117, pl. 171, f. 1685 (not well).

„ *cinerarius*, PULTENEY (not Linn.), Hutchins, Hist. Dorset. p. 44.—BLAINV. Faune Franç. Moll. p. 277, pl. 11, f. 10.

„ *umbilicatus*, MONT. Test. Brit. p. 286.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 153.—TURT. Conch. Diction. p. 186.—FLEMING, Brit. Animals, p. 322.—FORBES, Malac. Monens. p. 24, animal.—MACGILL. Moll. Aberd. p. 324.—Brit. Marine Conch. p. 160.—BROWN, Illust. Conch. G. B. p. 18, pl. 11, f. 9, 11.—WOOD, Ind. Testac. pl. 29, f. 48.—HANLEY, Young Conch. p. 70.

„ *obliquatus*, DILLW. Recent Shells, vol. ii. p. 779.

As Da Costa wilfully changed the name of this shell, even while he regarded it as the *cinerarius* of Linnæus, we adopt on reflection the name by which Montagu distinguished it ; since he clearly pointed out that it was not the *umbilicaris* of Linnæus, for which Pennant had taken it.

A considerable degree of likeness exists between this species and *cinerarius*, from which its colour, the broader style of its painting, and the less numerous belts of its base serve to distinguish it.

It is a strong, opaque, and almost lustreless shell, of an orbicular-conic form, convex lateral outlines, a small and blunted apex, and a somewhat flattened base, that is rounded-off but yet subangulated at its edge. Upon a ground of dull greenish white, or pale olivaceous yellow, it is closely flexuously and rather obliquely streaked with narrow stripes (not lines) of purplish red or reddish slate-colour, which do not run parallel to each other, but diverge, for the most part, further apart at the lower part of the whorls, frequently become confluent above, and are often interrupted, and occasionally somewhat reticulated, upon the base. There are several simple raised spiral lines, that for the most part are decidedly narrower than their interstices, are sometimes prominent, yet at times so ill-defined at their lower edges that the shell seems imbricato-sulcated ; these are replaced at the basal margin by simple striæ (which are often obsolete), and are again renewed upon the base, where the belts or sulci are by no means numerous, and rarely much elevated. There are about five and a half moderately increasing volutions, that are rather depressed in proportion to their breadth, much shelving, and rather more convex below than above ; the umbilicus is profound, moderate in size, and margined with white. The mouth is rather large, and decidedly broader than it is long; in general it occupies half the length of the shell, and more than half of the basal diameter; it is pearly within, and is not distinguished by any sculpture. The outer lip is acute, and generally bordered with rather a wide strip of the external colouring, with a predominancy of dirty green, which latter tint is more particularly apparent at the base of the short and not particularly oblique columella, which is white, subarcuated above, a little reflected, and somewhat flattened behind. The size is about that of the flattened variety of *cinerarius*.

We have taken alive in the islet of Herm, near Guernsey, a very remarkable variety which exhibits no trace of a perforation when adult, and only a slight indication of one when young. Except that it is rather more elevated, and that the painting of the smoother and rather more convex base displays a more reticulated appearance than in the majority of individuals of the commoner form, we can discern no difference in the characteristics.

The animal is of a general dusky greenish purple hue. The snout is finely crenated at its edge and is of a greenish colour, with transverse purple lines. The tentacula are long and setaceous, minutely ciliated, and conspicuously ringed with purple. Between them are two well-developed but well-separated crenated head-lobes. The eye-peduncles are stout and greenish-white, with greenish-purple eyes. The neck-lappets are pale, marked with greenish opaque yellow dots and purple: the inner one has a fringed margin, the outer is even-edged. The lateral cirrhi, which, though long, are not so long as in *cinerarius*, are finely rayed with purple, and have each a white tubercle and minute mucronated process at the base: there are three on each side. The sides of the foot are closely lineated with greenish brown or rich purple; the lateral membranes above them are paler and more of a greenish yellow hue; the disk of the foot is pale tawny white, oval, rounded at each extremity, finely and minutely fringed at the edges, and marked with a groove down the centre. This groove is conspicuous also in the foot of the preceding species. The dentition appears slightly different from that of *cinerarius*.

This is a littoral shell, living on fuci and rocks, between tide-marks and usually forming a zone above that of *cinerarius*. Though very abundant wherever it occurs, its distribution is peculiar, being confined to our southern and western coasts. It does not appear to range northwards of the Hebrides, and is absent from the entire eastern side of Great Britain. It ranges all round Ireland, and is abundant on the shores of the Irish seas. Its southernmost recorded foreign locality is Vigo Bay (M'Andrew). It is not known fossil.

### T. Magus, Linnæus.

Orbicular-conic; whorls scalariform, nodulous above, with fine spiral striæ, and an inferior marginal belt; umbilicus very large.

Plate LXV. fig. 6, 7, and (Animal) Plate D D, fig. 3.

Knorr, Délices des Yeux, pt 6, pl. 27, f. 4.

*Trochus Magus*, Linn. Syst. Nat. ed. 12, p. 1228. — Penn. Brit. Zool. ed. 4, vol. iv. p. 127, pl. 80, f. 107. — Pulteney, Hutchins, Hist. Dorset, p. 44. — Donov. Brit. Shells, vol. i. pl. 8, f. 1. — Mont. Test. Brit. p. 283.—Maton and Rack. Trans. Linn. Soc. vol. viii. p. 151. — Rackett, Dorset Catalog. p. 48, pl. 16, f. 1, 2. — Turt. Conch. Diction. p. 186, f. 64. — Fleming, Brit. Anim. p. 321. — Forbes, Malac. Monens. p. 23, animal.—Brit. Marine Conch. p. 160.—Brown, Illust. Conch. G. B. p. 17, pl. 11, f. 12, 15. — Born, Testac. Mus. Cæs. p. 330. — Chemn. Conch. Cab. vol. v. p. 101, pl. 171, f. 1656, 1657, 1659; vol. xi. p. 163, pl. 196, f. 1886. — Dillw. Recent Shells, vol. ii. p. 774.—Lam. Anim. s. Vert. (ed. Desh.) vol. ix. p. 130. — Wood, Index Testac. pl. 28, f. 34. — Blainv. Faune Française, Moll. p. 280, pl. 10, a,

f. 1 to 4.—DESH. Encycl. Méth. Vers, vol. iii. p. 1072.—GEVENS, Conch. Cab. (ed. 2) pl. 11, f. 84; pl. 12, f. 88, 96, &c.—PHILIPPI, Moll. Sicil. vol. i. p. 179; vol. ii. p. 152.—HANLEY, Young Conch. p. 67.

*Trochus tuberculatus*, DA COSTA, Brit. Conch. p. 44, pl. 3, f. 1.

This is a solid opaque and rather lustreless shell, of a somewhat depressed orbicular-conical form, with a scalariform but not arcuated lateral outline. The exterior is variegated with various tints and intensities of reddish, liver, rose colour, or more rarely with dark yellow, on a ground of impure white; the general style of painting consists of patches of the darker colour radiating from the sutures, succeeded by, or passing into, angularly flexuous, and often interrupted or subreticulated streaks upon the base of the body; there are generally, also, two or three narrow articulated fillets upon the lower portion of the larger whorls, and sometimes upon the base likewise. Beneath the sutures the surface is adorned with rather large flexuous irregular blunt knobs, that are longer than they are broad, but are not unfrequently almost obsolete; below them lie a few scarcely raised rather distant spiral striæ. A somewhat broader belt margins the base of each of the whorls; above it is a rather deep sulcus, that is minutely honey-combed by close-set obliquely longitudinal lamellæ. Numerous spiral lines, that are almost belts upon the younger shells (on which, for the most part, the subsutural knobs are not developed, but the upper spiral lines are often subgranose), encircle the base; these usually become obsolete in aged individuals. There are six moderately enlarging rather narrow scalariform volutions, which, flattened and subangulated above, flattish and but little shelving at the sides, and defined by a very strongly-marked suture, terminate in a small and rather pointed apex. The base is plano-convex, and moderately shelving;

the umbilicus is large, deep, funnel-shaped, white, and externally defined by a spiral hollow. The aperture is squarish, and much broader than it is long; its vertical length is about two-fifths that of the entire shell; its breadth is about half the basal diameter; there is no particular sculpture; the nacre is usually tinged with pink or flesh-colour. The outer-lip is acute; the pillar is white, rather obliquely subrectilinear, yet a little incurved posteriorly, and meets the whorl above it at nearly right angles. The vertical height of a large specimen, whose base measured all but fourteen lines, scarcely exceeded two-thirds of an inch; these proportions are, however, extreme, as the general length is only one-third less than the basal diameter.

The beauty of the hues of the shell in this *Trochus*, is exceeded by the painting of the animal, which rejoices in a skin of most vivid colouring. The muzzle is dark pinkish blue, speckled with opaque white towards its extremity. The subulate tentacles are pale yellow, with purple rings, darker above than below. The head-lobes are very large, more or less crenated, of a rich orange, sometimes approaching scarlet, with a border of bright yellow. The eye-peduncles are large, and of an orange colour; the eyes are vivid blue. The neck-lappets are orange, striped with flake white; the inner one is crenated at the edge. The lateral veils are of a sulphur yellow hue, with white specks, and are minutely rugose, with white dendritic papillæ. On each side are three pale tawny or yellow filaments, ringed with white; at their bases are white tubercles. The sides of the foot are closely and minutely speckled with purple, white and yellow, paler at the edges. The disk of the foot is elongated oval, rounded in front, of a yellowish-white hue, and has minutely fringed margins; a groove runs down the anterior half of its length. The rows of denticles on the lingual riband of this species are set very obliquely on each side of the central one, which has a broad base, a narrow but not contracted neck and a broad but shallow hook. The general character of the dentition approaches, but is very distinct from, that of *cinerarius*.

This fine shell is found all round our coasts, though not everywhere in equal abundance. It is most vividly coloured in southern localities. A white variety was noticed by Mr. Jeffreys in the Hebrides and Zetland. It lives in from three to twenty-five fathoms water, and is most abundant in from ten to fifteen fathoms. It is not known north of the British Isles, but ranges southwards to the Mediterranean. It has not been found fossil in our tertiaries. When artificially decorticated, so as to expose the nacre, it is sometimes made into ornaments, such as brooches and bracelets, with fine effect.

### T. LINEATUS, Da Costa.

Orbicular-conoid, strong, smooth, imperforated; painted with flexuous linear markings.

Plate LXV, fig. 4, 5, as T. crassus.

*Turbo lineatus*, DA COSTA, Brit. Conch. (1778) p. 100, pl. 6, f. 7.—DONOV. Brit. Shells, vol. ii. pl. 71.

*Trochus crassus*, PULTENEY, Hutchins, Hist. Dorset (1799), p. 44.—MONT. Test. Brit. p. 281.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 154.—RACK. Dorset Catalog. p. 48, pl. 17, f. 3, 7.—TURT. Conch. Diction. p. 188.—FLEMING, Brit. Anim. p. 322.—Brit. Marine Conch. p. 162.—BROWN, Illust. Conch. G. B. p. 19, pl. 11, f. 6, 7.—DILLW. Recent Shells, vol. ii. p. 796.—WOOD, Index Test. pl. 29, f. 87.

*Monodonta lugubris*, LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 180.—DELES. Rec. Coquil. Lam. pl. 36, f. 7.

*Trochus punctulatus*, BLAINV. Faune Française, Moll. p. 270, pl. 11, f. 2.

*Monodonta crassa*, MACGILLIV. Moll. Aberdeen. p. 325.

This very aberrant form of *Trochus*, differs so much from the rest of its British congeners, as to be readily distinguished by the veriest tyro in Conchology. It is strong, solid, opaque, with a coarse surface, yet smooth both above and below, except in the young, which is obscurely sulcated or closely girt with depressed obsolete costellæ, vestiges of which are frequently visible upon the smaller volutions of the adult shell. The shape is conoid, or orbicular conoid, and the lateral outlines are more or less convex. The exterior is, for the most part, of a yellowish ash or pale fawn-colour, subreticulately variegated with more or less crowded zigzag lines of a purplish black, whose angles are small and frequent. Slightly eroded examples, and these are the more common, exhibit an almost uniform tint of brownish black. The volutions, which terminate in a small, but generally abraded, blunt apex, are about six in number; they quickly enlarge, for the last whorl is longer than the whole spire, are high, the length of the penult being at the least equal to one half its breadth at the superior suture, and are decidedly rounded or even tumid, although just below the delicate but well-marked sutural line they are a little retuse. The base of the shell is rounded, yet a little compressed, especially upon the broad semicircular patch of white or ochraceous orange that lies behind the pillar-lip, nearly in the centre of the disk; this appears as if worn flat, and is occasionally bordered with bluish green. The basal circumference is not angulated; the axis is imperforated, but often exhibits, particularly in the more aged individuals, an indentation which resembles an incipient umbilicus. The mouth, which is very large, since even in mature individuals, it occupies nearly one half of the entire length of the shell, and in the young a still larger proportion of it, has a somewhat rounded figure; the breadth, which scarcely exceeds the length, is superior to one half of the basal diameter. The outer lip is simple, acute, and rather broadly margined with black or dusky green. It is considerably and continuously arcuated, yet is less convex in front than behind; it recedes so greatly anteriorly as to expose a large portion of the internal silvery nacre. The white pillar-lip is much bent, being subangulately curved in the middle, the nacre is only spread, and that too, sparingly upon the anterior portion of it. The pillar, which is broad, appressed, slightly oblique, and often a little concave in front, has the line of demarcation between it and the surrounding area almost entirely obsolete; it is furnished with a somewhat tooth-like projection at its inner edge, and sometimes (yet rarely) with a single indistinct transverse groove nearly opposite the middle of the umbilicoid indentation. The ordinary diameter is about an inch in both directions, a size frequently much exceeded in those worn and aged individuals that are generally rejected from our cabinets.

The operculum differs from that of its allies, and is loosely spiral in the centre.

The animal has the muzzle finely serrated at the margin, and of a dusky hue; the head-lobes are semicircular, and at their bases the head is marked with closely-set black lines. The tentacula are long, subulate, and ringed with closely-set fine black annulations. The eye-peduncles are stout, edged with yellow at their extremities, and bear black eyes. The neck-lappets are pale green, the inner one fringed at the edge, the outer one plain. The lateral veils are of a pale dull green hue, with a drab fringe at their margins; on each side there are three long filiform, extremely delicate cirrhi, white, annulated with dusky and having a white or yellow tubercle at the base of each. The sides of the foot are greenish yellow, marked with dark close-set interrupted lead-coloured lines, mingled with fine yellow opaque dots. The disk of the foot is oval, moderately elongated, rounded at both ends; grooved medially and anteriorly, of a dusky drab colour, with fine anastomosing yellowish white lines, and a fine light drab fringe at the edge. This account of the animal is extracted chiefly from the notes of Mr. Clark.

The range of this species is south-western and western. It inhabits the Channel Isles (S. H.); is frequent on the Devon and Cornish coasts, and along the southern and western shores of Wales. It is found round the southern, eastern, and western coasts of Ireland, extending northwards as far as 54½° N. lat. (Thompson). It is a littoral shell, always found between tide-marks. Mr. Jeffreys has a monstrosity, found at Exmouth by Mr. Clark, in which the operculum is irregularly spiral. It is not known as a British fossil. It ranges along the south-western coast of Europe.

### T. UNDULATUS, Sowerby.

Small, of an uniform pink or flesh-colour, not variegated; whorls with subsutural longitudinal undulations, and in general with spiral costellæ, but no marginal belt: rather a large umbilicus.

Plate LXVIII, fig. 1, 2, and Plate LXXIII, fig. 5, 6.

*Margarita striata*, LEACH, in Appendix to Ross's Voyage to North Pole (inadequately defined; but from types).—GRAY, Zoolog. Journ. vol. ii. p. 567.

*Turbo carneus*, LOWE, Zoolog. Journ. vol. ii. p. 107, pl. 5, f. 12, 13.—Brit. Marine Conch. p. 170.

*Margarita carnea*, SOWERBY, Malacolog. Magaz. p. 25; Conch. Illust. Marg. f. 9.—Brit. Marine Conch. p. xxxvii.—BROWN, Illust. Conch. G. B. p. 17, pl. 10, f. 36, 37.

*Margarita undulata*, SOWERBY, Malacalog. Magaz. p. 26 ; Conch. Illust. Margar. f. 4.—GOULD, Invert. Massach. p. 254, f. 172.*—REEVE, Conch. System. pl. 221, f. 4.

*Turbo incarnatus*, COUTHOUY, Boston Jl. Nat. Hist. vol. ii. p. 98, pl. 3, f. 13.

By regarding *Margarita* as only a section of this genus, we are compelled to prefer the later, but more characteristic designation of Sowerby, to that bestowed by Lowe upon the young of this species, since the epithet *carneus* has already been assigned to a *Trochus* in the pages of Gmelin. The occasional entire or partial absence of the spiral sculpture is a remarkable feature of this widely diffused and variable species. The shape in general is suborbicular and depressed conical; in large foreign examples it is sometimes almost conoidal ; the lateral outlines are more or less arched. The texture is not particularly thin, but in most individuals (from our own shores) is a little translucent; the surface is but moderately lustrous, and of an uniform colour, ranging in tint from a slightly empurpled rose to yellowish flesh-colour : the fry are quite white, hence the apex of the adult is usually of a paler cast than the rest of the exterior. Numerous short and wavy longitudinal folds emanate from beneath the strongly impressed, and often subcanaliculated, sutures, and densely disposed spiral costellæ, that in general are broader than their intervals, each interstice being almost immediately filled up by a narrower riblet, for the most part encircle the upper area of the shell; the lower surface being either smooth or merely traversed by more or less obsoletely raised spiral striæ. In one of our varieties the entire shell is destitute of costellæ ; in another the upper portion of the body-whorl alone is free from them ; the folds, however, are present in both. The riblets are sometimes prominent and rounded, sometimes plano-convex ; occasionally almost beaded near the undulations. There are five rather narrow whorls, which rapidly enlarge from a fine and rather acute apex; they are peculiarly well-defined, each base being suddenly perpendicular whilst the portion above is convexly shelving: at times the volutions are slightly flattened above likewise, so as to appear subscalariform. The base is a little compressed, yet tolerably convex: the umbilicus, which is profound, rather large, and funnel-shaped, has a somewhat abrupt commencement, and is at times bounded by a spiral line. The aperture, which has a roundish subquadrate contour, usually occupies half the entire length, and half the basal diameter, of the shell. Both lips are acute, simple, and arched; the anterior recedence of the projecting outer one is not considerable; the pillar, which is short, narrow, and very oblique, curls a little towards the umbilicus.

The basal diameter rarely exceeds the fifth of an inch in native examples; an individual of the smooth variety from Greenland measured five lines across.

The animal, which we have taken alive, and on which Mr. Alder has communicated his notes, is entirely white or yellowish white, with the exception of the black eyes and dark spots at the base of the lateral cirrhi. The head terminates in a broad crenated muzzle. The head-lobes seem to be obsolete; the tentacula are long, subulate, and finely but conspicuously ciliated; the eye-peduncles are rather short; the neck-lappets appear to be small; there are five lateral cirrhi on each side, three in the region of the operculum and two anteriorly placed. The foot is large, rounded in front, somewhat obtuse behind.

On the British shores this Mollusk is confined to the western and northern coasts of Scotland. It was first described as a native by Mr. Lowe, who found it at Oban.

It inhabits various depths of water from five to fifty fathoms, abounding most in from twelve to fifteen fathoms. Though widely diffused through the Hebrides, Orkneys, and Zetlands, it is not universally present in the regions, but occurs in patches of variable extent. The localities in which we have taken it most abundantly are Oban and Lerwick in Zetland; in the latter place it is frequent among *Modiolæ* and *Laminariæ* in seven fathoms water. The British localities are in the southernmost bounds of its range. It is an arctic species, ranging along the Scandinavian, Greenland, and Boreal American shores, and is probably of western origin and comparatively late migration, as we do not find it fossil in British tertiaries.

### T. HELICINUS, O. Fabricius.

Small, smooth, thin, umbilicated.

Plate LXVIII., fig. 4, 5, LXXIV. f. 10, and (animal) Plate CC. fig. 4.

*Turbo Helicinus*, O. FABR. (not Gmelin) Fauna Grœnland. p. 393.—PHIPPS, Voyage to North Seas, p. 198 (probably).

*Trochus Neritoideus*, GMEL. Syst. Nat. p. 3577.—DILLW. Recent Shells, vol. ii. p. 780.

*Turbo margarita*, MONT. Test. Brit. Suppl. p. 143.—TURT. Conch. Diction. p. 229. —LOWE, Zool. Journ. vol. ii. p. 107, pl. 5, f. 10, 11.—FLEMING, Brit. Animals, p. 299.—Brit. Marine Conch. p. 169.

*Helix margarita*, LASKEY, Mem. Werner. Soc. vol. i. p. 408, pl. 8, f. 5.—FLEMING, Encyclop. Edin. pl. 203, f. 9.

*Phorcus margarita*, RISSO, H. N. Europe Mérid. vol. iv. p. 133, f. 47 ?—MACGILLIV. Moll. Aberd. p. 134.

*Trochus margaritus*, GRAY, Zoolog. Journ. vol. ii. (name only).—JOHNSTON, Berwick Club, vol. i. p. 265.

*Margarita vulgaris*, LEACH, MSS. in Sowerby, Conch. Magaz. p. 24.—SOWERBY, Conch. Ill. Margarita, f. 13.—HANL. Brit. Marine Conch. p. xxxvii.

„ *arctica*, GOULD, Invert. Massach. p. 255, f. 173*.

„ *Helicina*, MÖLLER, Index Moll. Grœnl. p. 8.—LOVÉN, Ind. Moll. Scandin. p. 20.

„ *margarita*, BROWN, Illust. Conch. G. B. p. 17, pl. 10, f. 28, 29.

There are two forms of this shell, so apparently distinct at the first glance, that we hesitated to regard them as belonging to the same species, yet so intimately connected, that when we examine a long series of specimens from various localities we cannot separate them with precision. The one is peculiarly oblique and depressed, with a very expanded outer lip, and the rest of its features modified to correspond with the general contour; the other is far more globular, and reminds us a little by its shape of the common *Valvata (piscinalis)*.

The species is small, shining, translucent, smooth, except some minute and indistinct impressed spiral lines upon the base, and so thin that the internal nacre is visible through the external colouring, imparting to its horn-like hue a beautiful bronze-like lustre. For the most part two rather broad but undefined bands, of a deep flesh-like tint, encircle the body, the upper one of which is below, but not adjacent to, the suture; the lower, and less distinct one, is just above the basal circumference: occasionally they unite, so as merely to show a pale sub-sutural line upon the terminal volution. The shape, as we before remarked, is very variable, ranging from obliquely suborbicular to orbicular-conoid; the spire, however, is always a little raised, but its apex, though small, is blunt, and the apical volutions are rather depressed; the lateral outline is subrectilinear, or a little arched. There are five whorls, which rapidly enlarge; the body, or final volution, is disproportionately ample, and, as well as the penult, is more or less ventricose; their slope, in the more depressed variety, is very gentle, but becomes more considerable in the subconoid one: the sutural line is delicate. The base is more or less compressed, but is slightly convex. The umbilicus is rather large and profound; it is not bounded by any angular ridge, but is moderately shelving.

The aperture is nacreous, nearly circular, large, and more or less expanded; in height it rather exceeds one-half of the entire length of the shell; in breadth it occupies at least one-half the basal diameter. The outer lip is simple, acute, and recedes considerably in front; the pillar-lip is narrow, thin, arched, and erect, only folding back very slightly at the umbilical cavity. The breadth of the shell, which is superior to its length, is about the sixth of an inch.

The animal—for drawings of which we are indebted to Mr. Alder and Mr. Hancock — is of an orange colour, mingled with dusky. The muzzle appears to be very short, crenated, and deeply tinged on the summit with dusky. The tentacula are short in proportion to the body, rather stout, strongly ciliated. The head-lobes seem to be obsolete. The eye-peduncles are short. The neck-lappets are small, and even-edged. There are about five rather dusky lateral cirrhi on each side, three placed on the opercular region, and two anteriorly. The foot is rather large, oblong, obtuse in front and behind, tinged with dusky at the sides. The jaws are studded with closely-set papillæ. Each row of teeth on the lingual riband (according to the drawing by Mr. Alder) consists of a central denticle, which is rather broad anteriorly, strongly hooked, and wide-necked; flanked on each side by six rather obtusely and broadly hooked laterals, and a great number of narrow accessorials.

This little shell ranges along the northern shores of Britain on both sides, and is a littoral species, occasionally descending into the *Laminarian* zone. It is usually found among sea-weeds and under stones near low-water mark. It ranges from Yorkshire and Northumberland (Alder); northwards on the eastern coast (Bean); occurring in

Berwickshire (Johnston); Fifeshire (E.F.); Aberdeenshire (Macgillivray); very common among *Laminariæ* in Orkney (Thomas); Zetland (M'Andrew); Skye (E. F.); Oban, and elsewhere on the west coast of Scotland (Barlee); Arran, in the Clyde (Alder); north east coast of Ireland (W. Thompson). Its southernmost habitats are Dublin Bay (Warren) and Tenby (Lyons). Abroad its range corresponds to that of *undulatus*.

### T. PUSILLUS, Jeffreys.

Minute, suborbicular, perfectly smooth, semi-transparent: umbilicus narrow, longitudinally grooved at its commencement.

Plate LXXIII. fig. 3, 4.

*Margarita pusilla*, JEFFREYS, Ann. Nat. Hist. vol. xx. p. 17.

Although we entertain not the slightest suspicion of this minute shell being the fry of either *Helicinus* or *undulatus*, each of which, even in its earliest stage, exhibits spiral lines upon its base, it is nevertheless possible that this species may hereafter prove to be the young of some other northern shell not hitherto taken in our waters.

It is excessively thin, semi-transparent, shining, subnacreous white, or amber-coloured, and of a somewhat globosely orbicular form, with the anterior end of the aperture projecting considerably below the basal level. The general surface is quite smooth, yet, upon some of the larger specimens, there seem faint traces of longitudinal wrinkles. There are three convex whorls, that are neither depressed nor flattened, well-marked near the suture, and are much less shelving above than in *Helicinus*. The body, which is extremely ample in proportion, is ventricose, and broadly rounded at the circumference; the penult volution is short, but convex; the apex is obtuse. The base is not compressed, but moderately rounded; the umbilicus is rather small, and is somewhat coarsely, though obscurely grooved in a longitudinal direction at its commencement. The aperture is very large, occupying about four-sevenths of the entire length, and at least half the basal diameter; it is circular and almost continuous; the outer lip is acute and simple, the pillar-lip narrow, erect, but inclining a little towards the umbilicus. The specimens described from (the types) are only the twenty-fifth part of an inch in width, and about the thirty-fifth of an inch in length. They were taken by Mr. Jeffreys at Lerwick, the Shetland Isles, and Loch Carron.

According to its discoverer it has a range of from ten to forty fathoms, and, besides the places mentioned, has been taken at Skye, at Falmouth, and Sandwich, and, by Mr. Clark, at Exmouth. Mr. Barlee informs us that he has taken it at Loch Carron, Loch Alsh, and at Oban.

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*Note.*—*Margarita olivacea*, Brown, Illust. Conch. G. B. p. 17, pl. 10, f. 30, 31. "Thin olive-coloured, pellucid, smooth, subglobose; body large, inflated; spire small, short, with three depressed volutions, terminating in a moderately pointed apex; aperture large, circular, standing out from the body; outer lip thin, continuous with the inner lip above, which is narrow, and a small circular umbilicus behind. Length two-tenths of an inch. Found at Greenock by Stewart Ker, Esq."

Neither ourselves nor any of our many correspondents have recognised this shell, which in shape is represented as not unlike a very large *pusillus*. Judging from the locality given it was probably a pleistocene fossil.

*M. aurea*, Brown, Ill. Conch. G. B. p. 17, pl. 10, f. 23. "Strong, with four depressed, well divided volutions, covered with very strong spiral striæ; aperture round, which, with the pillar-lip, is tinged with a golden metallic hue; outer lip strong; inner lip smooth, very broadly reflected on the columella, and somewhat sharp at the base; colour of a deep brownish-pink, with a golden metallic lustre. Length and breadth about a quarter of an inch. Found at Seaton, Northumberland, by W. C. Trevelyan, Esq."

The figure looks like a foreign *Turbo*. We hope to examine the type before the conclusion of our work.

## SPURIOUS.

### T. CINEREUS, Da Costa.

LISTER, Hist. Conch. pl. 633, f. 21.

*Trochus cinereus*, DA COSTA, Brit. Conch. p. 42, pl. 3, f. 9, 10.—MONT. Test. Brit. p. 289 ; Suppl. p. 119.—DONOV. Brit. Shells, vol. v. pl. 155, f. 2.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 152.—TURT. Conch. Diction. p. 188.—DILLW. Recent Shells, vol. ii. p. 782.

„ *excavatus*, LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 150.—DELES. Rec. Coquil. pl. 36, f. 4.

*A native of the West Indies; introduced by Da Costa as found in several parts of Great Britain.*

### TURBO RUGOSUS, Linnæus.

KNORR, Délices des Yeux, pt. 4, pl. 7, f. 1.

*Turbo rugosus*, LINN. Syst. Nat. ed. 12, p. 1234.—CHEMN. Conch. Cab. vol. v. p. 195, pl. 180, f. 1782 to 1787.—LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 196.—BLAINV. Faune Française, Moll. p. 295, pl. 12, f. 1.—COSTA, Test. Sicil. p. 101.—Mag. de Zool. (Guérin's) series 1, Moll. pl. 39, animal.—DESH. Encyc. Méth. vol. iii. p. 1097.—PHILIPPI, Moll. Sicil. p. 178, and vol. ii. p. 151.—REEVE, Conch. Icon. vol. iv. Turbo, pl. 6, f. 26.

„ *calcar*, GMEL. Syst. Nat. p. 3592 (part only).—MONT. Test. Brit. Suppl. p. 137, pl. 29, f. 3.—TURT. Conch. Diction. p. 227.

„ *armatus*, DILLW. Recent Shells, vol. ii. p. 829.—Brit. Marine Conch. p. 169.

*Delphinula calcar*, FLEMING, Brit. Anim. p. 312.

*A Mediterranean shell, of which the young is figured by Montagu, as taken by Mr. Laskey at Iona.*

### TURBO CASTANEA, Gmelin.

*Turbo castanea*, GMELIN, Syst. Nat. p. 3595, (from Chemn. Conch. Cab. vol. v. p. 211, pl. 152, f. 1813, 1814). — Brit. Marine Conch. p. 167. — DILLW. Recent Shells, vol. ii. p. 836. — GEVENS (ed. Bach.), p. 34, pl. 16, f. 150, 152.

„ *mammillatus*, DONOV. Brit. Shells, vol. v. pl. 173.—MATON and RACK. Trans. Linn. Soc. vol. viii. p. 166.—MONT. Test. Brit. Suppl. p. 126.—TURT. Conch. Diction. p. 206.—FLEMING, Brit. Animals, p. 299.—COUCH, Cornish Fauna, pt. 2, p. 57.—WOOD, Index Testac. pl. 31, f. 47.

*Turbo hippocastanum*, LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 198.

„ *crenulatus*, GMELIN, Syst. Nat. p. 3595 (from Chem. vol. v. f. 1811, 1812).—KIENER, Coquilles Vivant. Turbo, pl. 27, f. 1.—REEVE, Conch. Icon. vol. iv. pl. 10, f. 42.

*A West Indian shell; introduced by Donovan as from the Scilly rocks.*

## PHASIANELLA, LAMARCK.

Shell usually rather compact, not nacreous, smooth, ovato-conical, with a produced spire. Aperture oval, the lips not continuous on the body whorl. Operculum calcareous, solid, tumid externally, subspiral on the inner surface.

Animal having the head muzzle-shaped; tentacula long, ciliated, eyes in distinct peduncles at their external bases; no intertentacular lobes; neck with a strongly fimbriated lobe on each side; lateral superior expansion of the foot with three cirrhi on each side, the middle pair often very small; foot rounded in front, pointed behind; vent on the right side and shortly tubular; branchial plume long, single, partially free; tongue closely resembling that of *Trochus*.

The only species of this beautiful genus which inhabits the British seas runs no risk of being confounded with the *Trochi*, though its animal is very nearly allied indeed to that group.

## P. PULLUS, Linnæus.

Plate LXIX. fig. 1, 2, 3, and (Animal) Plate D D, fig. 5.

LISTER, Hist. Conch. pl. 585, f. 44.

*Turbo pullus*, LINN. Syst. Nat. ed. 12, p. 1233. — PULTENEY, Hutchins, Hist. Dorset, p. 45. — DONOV. Brit. Shells, vol. i. pl. 2, f. 2. — MONT. Test. Brit. vol. ii. p. 319. — MATON and RACK. Trans. Linn. Soc. vol. viii. p. 162. — RACKETT, Dorset Catalog. p. 49, pl. 14, f. 1, 3. — TURT. Conch. Diction. p. 201, f. 45, 46. — Brit. Marine Conch. p. 186. — BORN, Testacea Mus. Cæs. Vind. pl. 12, f. 17, 18. — DILLW. Recent Shells, vol. ii. p. 872. — LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 217.

„ *pictus*, DA COSTA, Brit. Conch. p. 103, pl. 6, f. 1, 3.

*Phasianella pullus*, SOWERBY, Genera Shells, Phas. f. 4. — FORBES, Malac. Monensis, p. 21. — BROWN, Illust. Conch. G. B. p. 9, pl. 10, f. 42. — PHILIPPI, Moll. Sicil. vol. i. p. 187, and vol. ii. p. 158. — KIENER, Coquilles Vivantes, Phasian. pl. 5, f. 1. — REEVE, Conch. Systemat. pl. 223, f. 4.

*Cingula pulla*, FLEMING, Brit. Animals, p. 308.

*Rissoa pullus*, MACGILLIV. Moll. Aberdeenshire, p. 151.

For brilliancy of colouring and diversity of painting, we have nothing comparable among our native shells, to this beautiful little *Phasianella*. It is ovate-acute, strong, almost opaque when full grown, highly polished, and apparently smooth: a lens of ordinary power, however, generally exhibits some longitudinal wrinkles, and the microscope reveals most dense and minutely undulated spiral striulæ likewise. Among the more ordinary tints with which its exterior is adorned, purplish-rose, crimson, red, chocolate-colour, and brown, may be specified; these either form the ground itself (in which case the markings are pallid) or more frequently are profusely disseminated on a sallow or whitish surface. The patterns, which are of almost infinite variety, are composed of small spots and wavy linear streaks (more frequently angulated than not) that are sometimes mingled, sometimes uncombined; the latter are for the most part arranged in obliquely longitudinal series, but oftentimes, owing to the regular thickening of the wavy lines at certain distances from the suture all round the shell, a few interrupted spiral bands are formed in addition. A not unfrequent style of painting consists of broad wavy streaks of opaque white that radiate from the suture on a darker coloured ground. The space around the columella is almost invariably pale, but is generally traversed in a longitudinal direction by arcuated lines of colour. The whorls are four and a half in number, are separated by a simple suture, and rapidly enlarge from a small, but not very pointed, apex: those of the quickly attenuated spire, which altogether, when viewed from above (or dorsally), does not occupy more than three-eighths of the entire length, and only one-sixth when viewed ventrally, are somewhat rounded, and in proportion to their narrowness are tolerably high. The body, which is manifestly narrower posteriorly,—and this is more readily perceptible when the view is ventral,—is not regularly rounded, but both upper and lower slopes are merely convex, and the central portion is a little flattened. The base is imperforated, and is moderately long. The aperture, which is closed, when the animal is living, by a solid smooth and lustrous snow-white shelly operculum, is about half the total length of the shell, and four-sevenths of its basal diameter; it is pure white, devoid of all sculpture, and of a rounded oval shape, the length rather exceeding the width. The outer lip, which is simple, very acute, and arcuated, recedes in front: the pillar-lip is curved, broad, and appressed; its general inclination is rather perpendicular than oblique. Our largest example measures only three lines and a third in length, and two lines and a quarter in breadth.

The animal is brilliantly coloured, tinted with shades of purple, yellow, and often of green. The muzzle is rather short, and has slightly crenated yellow-tinged lips. The upper part and the head are marked with purplish brown and white, the latter colour arranged in streaks. The tentacula are long and of a yellowish white colour; they are strongly ciliated. The eye-peduncles are white, or tinged with green. The neck lobes are prominent, somewhat fan-shaped, and strongly fimbriated at their margins. The sides of the foot are tinged or streaked with purplish brown; its sole is of a lanceolate form, rounded in front and pointed behind. The lateral expansions of the foot give origin to three cirrhi on each side. The middle pair are usually, though not always, much smaller than those in front and behind, so small sometimes as to cause the animal to appear as if it had only two cirrhi on each side. In an example taken in Milford Haven, figured in Plate D D, the middle pair of cirrhi were greatly developed, whilst in one which we observed at Dartmouth they were almost obsolete, and could not be seen when the creature was in motion. Mr. Alder and Mr. Spence Bate have observed it with only two lateral cirrhi on each side. When walking it vibrates its tentacula, and uses them as feelers, at the same time giving its shell a slight see-saw movement.

This pretty shell is plentiful in most localities in the British Channel and Irish Sea, though rare and local on the eastern and northern coasts of Britain. Margate (S. H.); Oban (Jeffreys). All round the coasts of Ireland (W. Thompson). It ranges to the Mediterranean, but is not present in seas north of our own.

## ADEORBIS, Searles Wood.

Shell not nacreous, suborbicular, depressed, with few volutions, deeply umbilicated below. Peritreme entire, and nearly continuous, sinuated in its inner side, and slightly so externally. Operculum testaceous, multispiral.

Animal unknown.

We accept this genus as a good one although as yet the soft parts have not been observed. There can, however, be little doubt that its true position is among the *Trochidæ*. The peculiarity of the form of the mouth strikingly indicates the affinity of the somewhat dissimilar shells composing it. The number of different genera to which existing species have been referred indicates how doubtful their position was held to be, and how necessary it was to constitute them into a group apart. It has near affinities with *Delphinula* and *Scissurella*.

These shells appear to frequent the laminarian and coralline zones. They are all very small. The genus has members even so far as the Chinese seas. Mr. S. V. Wood enumerates five fossil species from the later British tertiaries.

### A. subcarinata, Montagu.

Body whorl very large, encircled by four spiral ridges, crossed by arcuated lamellar striæ.

Plate LXVIII. fig. 6, 7, 8.

*Helix subcarinatus*, Mont. Test. Brit. vol. ii. p. 438, pl. 7, f. 9. — Turt. Conch. Diction. p. 45.
*Trochus rugosus*, Brown, Mem. Werner. Soc. vol. ii. pt. 2, p. 520, pl. 24, f. 5.
*Cingula subcarinata*, Fleming, Brit. Animals, p. 305.
*Adeorbis subcarinata*, Searles Wood, Annals Nat. H. vol. ix. (1842) p. 530; Crag Mollusca, p. 139, pl. xv. f. 8.

*Trochus subcarinatus*, RECLUZ, Révue Zoolog. Cuvier. 1843, p. 108. — HANL. Brit. Marine Conch. p. xxxix. (altered from *Turbo s.* p. 170.) — BROWN, Ill. Conch. G. B. p. 19, pl. 11. f. 30, 31.

*Natica ? subcarinata*, PHILIPPI, Moll. Sicil. vol. ii. p. 141, pl. 24, f. 13.

It is to *Scissurella* and the smaller *Delphinulæ*, not to *Trochus*, that we must look for a sculpture analogous to the exquisite carving which distinguishes this beautiful shell from our other British testacea.

The shell is entirely white, strong for its size, almost opaque, or only a little hyaline, and of a rather oblique and very depressed turbiniform contour. It is composed of from three and a half to four volutions, which increase rather rapidly in size, are flattened or concave above, and are moderately rounded below; the apex is scarcely at all elevated. Four strong nearly equidistant spiral ribs adorn the exterior of the body whorl, which, moreover, has a slight marginal thickening below the well-marked suture likewise. The two stronger of the belts are seated upon the superior surface, and the upper is continued along the higher portion of the smaller whorls. They are all more or less nodosely crenated, in the fresher examples, by somewhat flexuously arcuated lamellar striæ, that traverse the exterior in a somewhat obliquely longitudinal direction. These latter are numerous, but not crowded, that is to say, are not broader than their interstices; are coarse upon the upper disk, and delicate upon the lower one, where they encircle the profound umbilicus. The base is more or less flattened, and the perforation is preceded toward the inner lip of the aperture by a broad shelving space that increases its apparent magnitude. The aperture is not distinctly nacreous, and is quite smooth; when viewed from below it appears of a rounded ovate figure; the inner lip, which recedes greatly, is a little reflected; the outer one is acute. The greatest diameter does not exceed the tenth of an inch.

The operculum is shelly, circular, flat, closely and concentrically multispiral, and presenting a punctured or frosted appearance on its surface.

This pretty little shell is of southern and western range. Though by no means scarce in southern localities, it is rarely taken alive, and the animal has as yet been unobserved. It is found at Herm (S. H). Dartmouth in twelve fathoms (M'Andrew and E.F). Fowey (Peach.) Exmouth, Sandwich, Swansea, Tenby (Jeffreys). Mr. M'Andrew has dredged dead specimens in fifty fathoms of water, sixty-five miles from land in the southern part of the Irish seas. On both sides of Ireland (W. Thompson); Burra island, Arran (Barlee); Dublin bay, Cork (Jeffreys).

It ranges to the Mediterranean, and is found fossil in both red and coralline crags.

## SCISSURELLA, A. D'ORBIGNY.

Shell thin, subglobose, more or less depressed, with a large body whorl and small spire; surface variously ornamented with striæ and grooves; mouth rounded, outer lip incised or perforated in the line of a spiral marginated groove which winds round the body whorl; an operculum.

Animal unknown. It appears, however, to have been met with by Sars,* and to hold the systematic position which we have assigned to it.

The minute shells for which this genus was founded are very interesting on account of the close resemblance they bear to the fossil genus *Pleurotomaria*, indeed it seems very difficult, if possible, to draw a line between the two groups. Until, however, the animal of *Scissurella* be better known, and the *Pleurotomariæ*, at present probably uniting creatures of different families, better investigated, it would be unsafe to merge the two genera in one.

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* Zeitschrift fur Malakozoologie, 1847, p. 3.

### S. CRISPATA, Fleming.

Plate LXIII. fig. 6.

*Scissurella crispata*, FLEM. Mem. Wern. Soc. vol. vi. p. 385, pl. 6, f. 3; Brit. Anim. p. 366; Treatise Moll. Anim. pl. 13, f. 48.—Brit. Marine Conch. p. 152.—BROWN, Illust. Conch. G. B. p. 62.

A more extended knowledge of the influence of climate upon form, as well as sculpture, may greatly enlarge the synonymy of this minute and beautiful shell; for assuredly several of its congeners approach it most closely in general characters. It is thin, semitransparent, of a pure and uniform white, and, in the individuals we possess (yet these probably are dead specimens), but little shining. The shape is obliquely suborbicular, and more produced at the base than at the spire; the lateral outlines of the upper disk are convex. The sculpture, which is very elegant, and enriches alike the entire superficies, consists of a crowded decussation of delicate longitudinal and spiral laminar striæ, both series being narrower than the intervals between them. The latter, which are chiefly visible in the interstices, and are rather the more minute, produce a crisp or slightly curly appearance where they intersect the others. A broad spiral groove, with raised edges, that terminates in a rather long fissure, winding along the bases of the smaller volutions, and encircling the body just above the middle, interrupts the graceful curves of the longitudinal striæ, and produces a divarication of them, since those lying above it are more obliquely arcuated than those below it (which otherwise, both in strength and approximation, they exactly resemble), whilst those inclosed within it lean in an opposite direction to the two other series. The whorls, which are three in number, increase with some rapidity, and terminate in a flattened apex; although not much elevated, they are tolerably large, and being depressed above, but well rounded below, appear somewhat scalariform; the body-volution slopes with a gentle convexity from the well-marked suture. The base is not compressed, but rounded, and swells out near the lip to an extent almost equal to the rise of the spire; the axis is perforated by a simple and wide-mouthed umbilicus. The large aperture which is obliquely set, and of a depressed rounded-subquadrate form, bulges out considerably near the outer anterior corner; it is broader than it is long; the length occupies more than one half of the entire shell, the breadth is rather superior to one half the basal diameter. The outer lip, which greatly recedes in front, is simple, acute, and much arcuated, but its continuity is disturbed by the fissure, where it pouts out in an acuminated form, both above and below, becoming in the latter position peculiarly arcuated and effuse. The pillar-lip, which is more or less broad and flatly reflected, yet not appressed, is retuse behind; it is short, and is either straight or leans away from the outer lip. The breadth of most of the specimens hitherto obtained is not much more than the tenth of an inch, and this is nearly twice the length, which does not very much exceed two-thirds of a line.

This beautiful but minute shell was discovered in 1809 by the Rev. Dr. Fleming, who found it in sand from Noss Island, one of the Zetland group. Mr. Barlee has taken it at East Tarbert (Long Island), Loch Fyne, and on the north and east sides of the Zetland isles, where he observes that it is "abundant in dredged shelly sand, and off stones in deep water on the Haaf ground." Lieut. Thomas finds it abundantly in seven fathoms of water, at Sanda Sound in the Orkney Isles.

## IANTHINIDÆ.

Swainson, who, whilst he has indulged overmuch in fanciful analogies and gone astray after phantom affinities, has frequently offered suggestions respecting the relationship of genera in Mollusks highly worthy of consideration, held that *Scissurella* had distinct affinities with *Ianthina*. The presence of a true operculum in the former genus prevents our associating them in the same family, whilst the point of resemblance between them induces us to regard *Ianthina* as the type of a group nearly related to the *Trochidæ*. Often, however, as the animal of this curious genus has been observed, and notwithstanding its investigation by the skilful hand and thoughtful head of Cuvier himself, its affinities have puzzled systematists, and are likely to do so for some time. The position which we assign to it in this work can be regarded only as an approximation towards its true place. Besides the connection with *Trochus* and its allies already indicated, the structure of the apex of the shell would seem to point out an alliance with *Chemnitzia*, as has been suggested to us by Mr. Jeffreys, whilst the forms and arrangement of the lingual teeth and conformation of the reproductive organs, indicate affinity with *Scalaria*, further borne out by the power common to the two genera of secreting a purple fluid.

## IANTHINA.

Shell ventricose, subglobular, thin, translucent, smooth or striated. Aperture more or less triangular, outer lip sub-emarginated, columella straight. No operculum.

Animal with a large muzzle-shaped head, bearing a tentacle and a sustentacle on each side, but presenting no traces of eyes. Foot short, secreting a float composed of numbers of cartilaginous vesicles, on the under surface of which the egg-vesicles are borne. Sexes separate. Branchiæ of two plumes. Lingual band without axile teeth, but having two series of lateral uncini, slender and narrow, obtuse above and pointed below (Löven).

These animals are pelagic, floating about on the surface of the ocean, often in myriads, and apparently always gregarious when in their natural haunts. The float attached to the foot was first (as well as the shell itself) noticed by Fabius Colonna in 1616: he designated it by the expressive and appropriate name of *spuma cartilaginea*. Cuvier observed that there was no anatomical connection between the two bodies. This was confirmed by Dr. Coates, who, in the fourth volume of the "Journal of the Academy of Natural Sciences of Philadelphia," gives an interesting account of his experiments on the float in the living animal. He found that it was entirely secreted by the foot, and that when a portion was removed, the injury was rapidly repaired. The egg-bags are attached to the under surface of the float, and, as well as that organ itself, appear to differ in form and arrangement in the different species. Dr. Coates remarks that the animal seems to occupy considerable time in the deposition of its eggs, the bags nearest to the extremity of the float being constantly found empty, while the central ones contain young shells fully formed, and those towards the animal are filled with eggs. "It appears probable," writes that observer, "that the young animals, when liberated from their chambers, ascend the float of the mother, and in this way gain access to the surface and construct the elements of their future support."

### I. COMMUNIS, Lamarck.

Broader than long, angulated at the circumference; aperture subtrapeziform; outer lip meeting the pillar at right angles.

Plate LXIX. fig. 6, 7.

*Helix ianthina*, LINN. (not Brookes) Syst. Nat. ed. 12, p. 1246 (part only).—BROWN, Mem. Werner. Soc. vol. ii. pt. ii. p. 525.—TURT. Conch. Diction. p. 58, f. 96.—Dillw. Recent Shells, vol. ii. p. 938.

*Ianthine*, CUVIER, Ann. du Mus. vol. xi. (1808), pl. 1, f. 1; Animal, f. 2 to 8 (? all).

*Ianthina fragilis*, LAM. (not Dekay,) Syst. Anim. s. Vert.—MONTFORT, Conch. Syst. (1810), vol. ii. p. 214.—SOWERBY, Genera Shells, Ianth. f. 1.—SWAINSON, Zool. Illust. ser. 1, pl. 85.—SOWERBY, Manual Conch. f. 333.—D'ORBIGNY, Mol. Canar. p. 83, Animal.—BRODERIP, Penny Cyclop. vol. xiii. p. 90, and fig. at p. 89, animal.—REEVE, Conch. Syst. pl. 205, f. 1.

„ *communis*, LAM. Anim. s. Vert. (ed. Desh) vol. ix. p. 4.—FLEMING, Brit. Anim. p. 324.—Brit. Mar. Conch. p. 151.—BROWN, Illust. Conch. G. B. p. 24, pl. 8, f. 1, 2.—CROUCH, Introd. Lam. Conch. pl. 16, f. 3.—LESSON, Voy. Coquille, p. 361, pl. 8, f. 1 (probably).

*Ianthine violette, var.* BLAINV. Man. Malacol. pl. 37, bis, f. 1, a (not 1).

*Ianthina bicolor*, PHILIPPI, Moll. Sicil. vol. i. p. 164; vol. ii. p. 142.—COSTA, Test. Sicil. p. 112.

Encycl. Méth. Vers, pl. 456, f. 1.

In his earlier classification, Lamarck having termed the *Helix ianthina* of Linnaeus *I. fragilis*, without giving any description, has appended a synonymy to it, that fairly enough agrees with that shell. In his "Animaux sans Vertébres," he has, however, changed the name of his type to *I. communis*, and mingled the synonymy of the present species with that of the West Indian shell (characteristically enough represented by Chemnitz, vol. v. f. 1577, 1578), which, from our study of the Linnæan cabinet, we know to be the original *ianthina* of the Swedish systematist. We would suggest, then, the advisability of retaining the appellation of *fragilis* for that shell, and continuing that of *communis* to this far more abundant Mollusk.

Although thin and fragile, this shell is comparatively strong for its genus. The dark violet or purple hue of its basal superficies is exchanged upon its upper surface for a much paler tint; but whilst the superior or narrower portion of each whorl is almost white, the lower part is more or less stained with the characteristic generic colouring: in our smaller British examples a rather broad band of white encircles the axis. The shape is orbicular-conoid, and is horizontally compressed and generally but little rounded at the base. The surface is moderately glossed. Rather remote spiral lines, that are chiefly conspicuous upon the lower surface, and frequent irregular striæ that follow the lines of growth, are more or less apparent upon the exterior; besides these are some most minute and densely disposed spiral striulæ in the interstices of the stronger ones, but these are generally obsolete in the adult examples. There are from four to four and a half volutions, that rapidly enlarge from a very small, obtuse, and distorted apex. The chief breadth of each whorl is at its bottom, and not towards the middle, as there is an almost continuous plano-convex shelve from suture to suture; some few of our smaller examples, however, exhibit a slight shoulder, but we are inclined to regard this as exceptional. The proportion between the spire and the body appears subject to much variation, the former being much more elevated in fine Mediterranean examples than in our more stunted native ones, in which latter the turns of the spire are mostly depressed and rather short. The suture, which is distinct but simple, and never canaliculated, is generally succeeded at a little distance, especially upon the last whorl, by an indentation that runs parallel to it, and which produces the effect of margination. The body, which is very ample, but whose expansion is in a transverse and not a longitudinal direction, is more rounded above than below, and is rather bluntly angulated at its circumference. The aperture is subtrapeziform, and, at the least, as wide as it is long; it occupies fully four-sevenths of the basal diameter, and ranges in length from about five-sevenths to only half of the entire length of the shell; the younger the shell, the greater, in general, is the proportion occupied by it. The medial sinuation of the outer lip, whose outline is more arcuated posteriorly than in front, and which meets the pillar at a right angle, and the body at an obtuse angle, is very gradual, but of considerable extent. The general inclination of the pillar, which is about half the height of the shell and a little wavy, is nearly straight; its reflection wholly or partially conceals any umbilical chink: in most native specimens it is dark violet. The individuals mentioned by Brown as taken in Ireland measured an inch by an inch and a quarter, and hence were equal in dimensions to the fine Mediterranean examples; those which we have ourselves met with, chiefly from the Welsh coast, had not attained to more than half this size.

The animal is white, tinged often strongly with purple. The head is muzzle-shaped, thick, and rather long, with somewhat obtuse tentacles and cylindrical sustentacles.

The mantle is deeply tinged with purple. The disk of the foot is rather small and is margined with purple. The egg-vesicles are closely set on the under side of the large float. Dr. Coates describes the float of this species as being convex, subcarinate above, concave beneath, straight, and composed of large vesicles. The animal secretes its purple dye very rapidly. We painted some paper with it when fresh in 1837, and it still remains strongly coloured. Mr. Jeffreys writes: "On the 23rd of July, 1827, I picked up several hundreds of this shell on the sands in Oxwich bay, some of them having the animal and its dye sufficiently strong to stain a pocket-handkerchief." He also remarks that the apex of the shell is like a *Stylifer*, and inflected like that of *Odostomia*.

This is an oceanic shell, occurring chiefly on those parts of our coasts most exposed to the Atlantic. It has long ago been taken on the shores of Cornwall, and comes into the Bristol Channel, as Oxwich Bay, near Swansea, and Tenby (Jeffreys), Dawlish Warren (Mrs. R. Smith). A bicoloured variety has been taken by Miss Jeffreys at Bude in Cornwall. Mr. Couch remarks that the occurrence of this shell on the Cornish coasts "is altogether casual, and depends on a combination of wind and weather. The usual season is from July to November, when the wind is rough or long between west and south; under which circumstances several floating animals, as *Physalia*, *Velella*, with the *Ianthinæ*, are driven on our coast from the Atlantic, sometimes in considerable numbers." Dr. Turton states that the fishermen's wives call them Bullhorns. "Drifted occasionally to the western, southern, and northern shores of Ireland" (W. Thompson).

### I. PALLIDA, Harvey.

Subglobose, almost smooth; circumference rounded, not angulated.

Plate LXIX. fig. 10, 11.

*Ianthina pallida*, HARVEY, MSS. cited by Thompson.—Brit. Marine Conch. p. 152.
? *I. nitens*, THOMPSON (not Menké), Ann. Nat. Hist. vol. v. p. 96, pl. 2, f. 2.
*Ianthina patula*, PHILIPPI, Moll. Sicil. vol. ii. p. 224, pl. 28, f. 14.

This rare *Ianthina* is perhaps equally entitled to be called *patula*, since both names appeared, as those of shells positively pronounced distinct from any known species, during the same year (1844); but as the shell had previously been well figured in the "Annals of Natural History," as the *I. pallida* of Harvey's MSS., although with "*? nitens*, Menké," prefixed (the caution was necessary, as in the earlier works of that conchologist, the descriptions were so brief as to render recognition most uncertain), the balance seems in favour of the name bestowed by the British writers.

The shape of this elegant shell is globose-subtrigonal, and the length and breadth are nearly equal. Its surface, which is but moderately glossy, and nearly smooth, merely presenting, in addition to its lines of increase, most delicately fine but densely disposed and universally diffused wavy spiral striulæ, is of a very pale violet, but assumes a deeper tone of colouring upon the columella, and towards the extreme anterior extremity. There are three and a half volutions, that, instead of continuously sloping from the suture—which is but very slightly oblique, profound, and even canaliculated eventually—are well rounded below, but depressed above. The spire is extremely short, and, when viewed dorsally, appears to occupy only one-fifth or one-sixth of the entire length: its apex is flattened, or even sunken. The body-whorl is not angularly contracted at its circumference, but is ventricose and rounded; yet the arch of its lateral outline is not regular, but displays a little flatness both above and below the middle of it: the base is not at all compressed, but distinctly rounded. The aperture, which is extremely ample, and patulous, occupies, for the most part, four-fifths of the length of the shell; it is of a somewhat abbreviated ovate shape, but its regularity is affected by the roundness of the last whorl, and the comparative straightness of the pillar lip, the angle of whose union is always a very obtuse one. The general arcuation of the outer lip, which recedes but little at the base, is almost uninterruptedly semicircular; it rises, instead of declining, at its junction with the body, and unites with the pillar in a curved line, thus rendering the anterior extremity of the mouth rounded instead of angular. It is not angularly incised in the middle, but only subangulately sinuated; this character is observable through the lines of growth, even where the lip (too commonly the case with all *Ianthinæ*) has been broken. The pillar lip, which is rather broad, and convexly reflected, is not oblique, but is often a little sinuous; it does not quickly attenuate, but continues of nearly the same width down to its anterior extremity. Behind it lies a narrow subumbilical cavity, that is partially concealed by the curl of the upper portion of the pillar-lip. Foreign individuals often measure an inch in both directions, but the few individuals thrown upon our own coast are not quite so large.

In our description we have been careful to particularize the points in which the species differs from the *globosa* of Swainson, its nearest congener; the narrow pillar-lip, and the attenuated front extremity of the latter are perhaps the most striking distinctions.

This species was first described as distinct by Mr. W. Thompson, to whom it was communicated by Professor Harvey, who found it at Miltown Malbay, in Clare, where it had also been found by Mr. J. D. Humphreys, whose specimen is now in the Jeffreysian cabinet.

### I. EXIGUA, Lamarck.

With longitudinal lamellar wrinkles; spire rather elevated.

Plate LXIX. fig. 8, 9.

*Ianthina exigua*, LAM. Anim. s. Vert. (ed. Desh.) vol. ix. p. 5.—TURTON, Mag. Nat. H. vol. vii. p. 352.—COUCH, Cornish Fauna, pt. 2, p. 54.—Brit. Marine Conch. p. 151.—BROWN, Illust. Conch. G. B. p. 24, pl. 8, f. 16, 17.—SOWERBY, Genera Shells, Ianth. f. 2, 3.—SWAINSON, Zool. Illust. ser. 1, pl. 85.—LESSON, Voyage Coquille, p. 368, Moll. pl. 8, f. 4.—DESH. Encycl. Méth. Vers, vol. ii. pt. 2, p. 325.—REEVE, Conch. Systemat. pl. 205, f. 2, 3.

*Ianthine violette*, BLAINV. Man. Malacol. pl. 37, bis, f. 1 (not 1, a).

„ *naine*, QUOY and GAIMARD. Voy. Astrolabe, Moll. pl. 29, f. 5, 6, 7, animal (probably).

Encycl. Méth. Vers, pl. 456, f. 2.

The densely disposed irregular lamellar wrinkles, that roughen the surface of this extremely fragile shell, render it easily distinguishable from its described congeners. It is of a somewhat conoidal subglobular shape, and is attenuated both above and below; the violet hue of its colouring has somewhat of a reddish cast, and becomes very pale, or almost white, upon the upper portion of the body, and very faint, oftentimes, beneath the simple but well defined suture of the superior volutions. Of the five whorls, those of the spire are rounded but sloping, are not particularly narrow, are moderately raised, and of gradual enlargement. The spire is rather elevated for the genus, generally occupying, when viewed dorsally, about one-third of the length; it terminates in an acute and very small distorted apex. The body-whorl is subangulated in the line of its junction with the outer lip, and is usually, in the adult, distinguished at that circumference by a shallow, groove-like, spiral indentation. Beneath this the raised longitudinal wrinkles, which above it are narrower than their interstices, and run with an oblique arcuation, suddenly diverge with an opposite inclination, and become still more crowded than before. There are no spiral striulæ. The basal area is not compressed, but occupies a considerable portion of the length of the shell; its convexity is rather less than that of the upper surface. There is a small umbilicus, that is often but little apparent from the reflection of the pillar lip; which latter is elongated, nearly straight, and, generally, of a paler hue than the portion behind it. The aperture is longer than wide, and is of a somewhat broad semilunar form. The sinus of the outer lip is angular and profound. The length of our Irish specimens is half an inch, and the breadth four lines at the least.

The figure which appears to represent this animal in the beautiful designs of Quoy and Gaimard, differs from the *communis* in exhibiting a foot much larger in proportion, slenderer tentacles, a shorter float, and more scattered egg-vesicles. Dr. Coates describes the float of *exigua* as being straight, narrow, flattened, and composed of small vesicles, bearing the egg-vesicles on the under surface, attached by a little line of pearly fibres.

This species is much rarer than *communis*, and, like it, oceanic. Turton announced its occasional occurrence, along with the larger one, in the small coves about the Land's End. Mr. Jeffreys has it in the Turtonian cabinet from

Ilfracombe, Mount Bay, and Land's End; also from Kilkee, County Clare, in the collection of J. D. Humphreys. It was first announced, we believe, as Irish by Mr. R. J. Shuttleworth, who took it in Connemara. Dr. Farren has found it at Roundstone in Galway, and Mrs. Puxley in Bantry Bay (Jeffreys).

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